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Printed on Thin Paper for Foreign Circulation.

"THE ENGINEER," DECEMBER 31, 1926.

With METALLURGICAL SUPPLEMENT.

The Engineer.

Established 1856.

Registered as a Newspaper.

OFFICE FOR ADVERTISEMENTS & PUBLICATION, 33, NORFOLK ST., STRAND, LONDON, W.C. 2.

VOL. CXLII.—No. 3703] LONDON: FRIDAY EVENING, DECEMBER 31, 1926 [PRICE {WITH SUPPLEMENT} ONE SHILLING BY INLAND POST 1s. 3d.

PUBLIC NOTICES

The Director - General, India Store Department, Branch No. 16, Belvedere-road, Lambeth, S.E. 1 invites TENDERS for :—

1. 400 PAIRS of DISC WHEELS and AXLES for RAILWAY CARRIAGES and WAGONS.
2. 108 BAND SAWS for TIMBER.
3. OVERHEAD ELECTRIC TRAVELLING CRANES :

40 Tons Lifting Capacity	2
25 Tons Lifting Capacity	4
120 Tons Lifting Capacity	2
8 Tons Lifting Capacity	3
5 Tons Lifting Capacity	1

Tenders due on Friday, the 14th January, 1927, for No. 1, on Tuesday, the 18th January, 1927, for No. 2, and on Tuesday, the 25th January, 1927, for No. 3.

Specifications and forms of Tender obtainable from (the above at a fee of 5s. per set, which will not be returned. 4308

Assistant Engineer REQUIRED for the PORT HARCOURT WORKS, NIGERIA, for a tour of 12 to 18 months' service, with possible extension. Salary £480 for three years, then £510, rising by annual increments to £920 a year. Outfit allowance of £60 on first appointment. Free quarters and passages and liberal leave on full salary. Candidates, 25 to 35 years of age, must have had actual experience of Harbour Works Construction and Marine Survey Work, including the taking of soundings.—Apply at once by letter, stating age, qualifications and experience, to the CROWN AGENTS FOR THE COLONIES, 4, Millbank, London, S.W. 1, quoting M/15034. 4310

Assistant Engineers (2) REQUIRED for the KENYA and UGANDA RAILWAY for a tour of 20 to 30 months' service, with possible extension. Salary £480, rising to £720 a year by annual increments. Free quarters and passages and liberal leave on full salary. Outfit allowance of £30 on first appointment. Candidates, unmarried, 22-28 years of age, must have passed examination to qualify for A.M.I.C.E. or hold equivalent professional qualifications, and have had some experience on Railway Civil Engineering Work.—Apply at once by letter, stating age, qualifications and experience, to the CROWN AGENTS FOR THE COLONIES, 4, Millbank, Westminster, London, S.W. 1, quoting at head of application M/15132. 4309

Chief Engineer Required by the GOVERNMENT of CEYLON in connection with the completion of the Hydro-electric Scheme and Transmission Lines to Colombo and their development. The person engaged will also assume responsibility for the working of the existing power station and distribution in Colombo and its extensions, as well as of all Government electrical work except postal and railway telegraphs and telephones. The hydro-electric scheme now under construction consists of a small dam, 8000ft. of tunnel and two 48in. pipe lines with a power-house containing 15,000 kilowatts of turbine plant. The transmission line to Colombo is about 50 miles. The pressure is 88,000 volts. Distribution at Colombo will be three-phase. Candidates, age 35 to 45, should preferably be Corporate Members of the Institution of Civil Engineers and also Members of Institution of Electrical Engineers. They must possess practical experience of the construction and operation of hydro-electric power installations and especially the distribution of electricity upon a large scale. Good administrative ability essential. Salary £3000 a year with free quarters. Free first-class passages and, if married, for wife and children also, not exceeding four persons beside the candidate selected. Period of engagement five years.—Intending applicants should write to the CROWN AGENTS FOR THE COLONIES, 4, Millbank, London, S.W. 1, for forms of application, quoting M/15060, and enclosing a stamped addressed foolscap envelope. 4289

Required by the Government of NIGERIA for ROAD SURVEY and CONSTRUCTION :—

9 ENGINEERS IN CHARGE OF PARTIES, M/15100. Salary £800 per annum, rising by annual increments to £920, with seniority allowance of £72 a year whilst in the Colony. Candidates should have had experience on road and bridge or railway construction.

13 ASSISTANT ENGINEERS, M/15093. Salary £480 for three years, then £510, rising by annual increments to £920. Outfit allowance of £60 on first appointment. Candidates should have had experience on road and bridge or railway construction.

22 FOREMEN OF WORKS, M/15071. Salary £400, rising by annual increments of £12 to £500, with outfit allowance of £45 on first appointment. Candidates should have had experience on public works, preferably on road or railway construction.

The period of engagement is for two tours of from 12 to 18 months each, with possible extension. Free quarters and passages provided and liberal leave on full salary is granted after each tour of service. Age not to exceed 42.

Apply at once by letter, stating age and particulars of experience, marking envelope and letter with the number shown above against the vacancy for which application is made, to the CROWN AGENTS FOR THE COLONIES, 4, Millbank, London, S.W. 1. 4302

The High Commissioner for India REQUIRES an ASSISTANT ENGINEER INSPECTOR (Mechanical) for service in England. The post is on a non-pensionable basis and will be held in the first instance on probation for two years, during which period the services of the incumbent may be dispensed with at one month's notice. Thereafter service will be terminable by six months' notice on either side.

Salary £150, rising by annual increments to £300. Prospect of £310, rising by annual increments to £400, by promotion to Inspector. These salaries carry a variable cost-of-living bonus on the Civil Service scale. At present the bonus on £150 amounts to £82.

Candidates should be 28 to 35 years of age, have good technical and shop training and have held some position of responsibility. All-round rather than specialised experience is desirable. Preference given to A.M.I. Mech. E. or equivalent. Previous inspection experience not essential.

Applications, stating age, training and experience, and enclosing copies of recent testimonials, to be sent to the DIRECTOR-GENERAL, India Store Department, Belvedere-road, Lambeth, S.E. 1, not later than the 15th January, 1927. 4292

The Engineer

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Direct Conversion of Low Pressure Superheats into Super Pressure.
(C. B. K.) THE ENGINEER, 31 - 12 - 26.

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The Railway Signal Engineer.
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(HANSFORD & FAULKNER.) THE ENGINEER, 31 - 12 - 26.

New Mining Practice in South Africa.
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PUBLIC NOTICES

Draughtsmen, Grade III, REQUIRED at the Royal Aircraft Establishment for work in connection with the design of Wireless and Photographic Apparatus. Candidates should have good technical education and suitable shops and drawing-office experience. Salary from 40s. to 52s. per week plus Civil Service bonus, depending on experience. The corresponding total remunerations are 64s. 2d. and 83s. per week. Ex-Service men preferred.—Apply, quoting A. 140, to the CHIEF SUPERINTENDENT, R.A.E., South Farnborough, Hants. 4295

Crystal Palace School of Practical Engineering.
Founded 1872.
MECHANICAL AND CIVIL ENGINEERING DIVISIONS.
PRESIDENT : J. W. WILSON, M.I.C.E., M.I.M.E.
PRINCIPAL : MAURICE WILSON, M.I.C.E.
Assisted by Staff of Lecturers and Instructors.
Thorough, up-to-date Practical and Theoretical Instruction. Course completed in 2 years.
Students admitted at beginning of any term. 4307

Huddersfield Education Committee.
HUDDERSFIELD TECHNICAL COLLEGE.
(Principal : J. F. HUDSON, M.A., B.Sc.)
APPLICATIONS are INVITED for the POSITION of ASSISTANT LECTURER and DEMONSTRATOR in the Department of Mechanical Engineering. Good experience of experimental work in Applied Mechanics and Heat Engines is an essential qualification. Graduate preferred. Salary in accordance with the Burnham Scale. Statement of duties and form of application may be obtained on receipt of a stamped addressed foolscap envelope, and must be returned not later than Friday, 14th January, 1927.
L. G. THORNBER,
Director of Education.
Education Offices, Huddersfield. 4316

Government of Mysore.
The Consulting Engineers are prepared to receive by January 18th TENDERS for TWO METRE-GAUGE INDIAN STANDARD PASSENGER 4-6-0 LOCOMOTIVES and TENDERS. Specification and Tender form can be obtained from their office on payment of £1 (which will not be returned).
The Government do not bind themselves to accept the lowest or any Tender.
RENDEL, PALMER & TRITTON.
12-14, Dartmouth-street, Westminster, S.W. 1. 4314

PUBLIC NOTICES

Bombay, Baroda and Central India Railway Company.
The Directors are prepared to receive up to Noon on Wednesday, 12th January, TENDERS for the SUPPLY of :—

1. STEEL MATERIAL (Plates, Angles, Channels, Flats, &c.).
2. PIG IRON (West Coast Hematite).
3. FERRO-SILICON.
4. GALVANISED STEEL or IRONWORK.

Tenders must be made on forms, copies of which, with specification, can be obtained at these offices on payment of £1 each for No. 1 and 10s. each for Nos. 2, 3 and 4 (which will not be returned).
The Directors do not bind themselves to accept the lowest or any Tender.
S. G. S. YOUNG,
Secretary.
Offices : The White Mansion, 91, Petty France, S.W. 1, 23rd December, 1926. 4285

Southport, Birkdale and West Lancashire Water Board.
TENDERS FOR CAST IRON OR STEEL WATER PIPES.
The Water Board invite TENDERS from British Manufacturers for the SUPPLY and DELIVERY to Southport of about 337 TONS of CAST IRON SPIGOT and SOCKET PIPES, 12in. in diameter, or alternatively an equivalent length of STEEL PIPES lined internally and protected externally.
Specifications and conditions of contract may be obtained upon application to the undersigned, to whom sealed Tenders are to be delivered before 10 a.m. on Wednesday, 19th January, 1927.
The Water Board do not bind themselves to accept the lowest or any Tender.
C. BURTON EDE, M. Inst. C.E.,
Engineer and Manager.
14, Portland-street, Southport, 21st December, 1926. 4300

Wrought Iron Fencing.
CONCRETE PADDLING POND.
Contractors wishing to TENDER for about 1400 YARDS of WROUGHT IRON BOUNDARY RAILINGS with ELEVEN GATES for the new Cheltenham Pleasure Grounds, or for the CONSTRUCTION of a REINFORCED CONCRETE PADDLING POND, 90ft. by 45ft. by 18in. deep, including 900 CUBIC YARDS of EXCAVATION, are requested to make application to the BOROUGH ENGINEER, Municipal Offices, Cheltenham, by 7th January, 1927, when particulars will be forwarded. 4312

PUBLIC NOTICES

Oakengates Urban District Council.
WATERWORKS.
TO MANUFACTURERS OF TURBINE PUMPS OR CRUDE OIL ENGINES.
The Urban District Council of Oakengates invite TENDERS for the complete EQUIPMENT of a PUMPING STATION, to be erected over a bored well.
The works included in the contract consist of a Crude Oil Engine, a Turbine Bore-hole Pump, a Turbine High-lift Pump, together with all necessary Equipment and Connections inside the building, in accordance with the drawings, general conditions and specification prepared by the Engineers, Messrs. John Taylor and Sons, Caxton House, Westminster, S.W. 1.
The general conditions, specification and form of Tender may be obtained by the manufacturer or contractor at the office of the Engineers upon payment of £5 (cheque only), which will be returned upon receipt of a bona fide Tender.
Tenders, in sealed envelopes, endorsed "Tender for Pumping Plant," must be delivered at my offices, Oakengates, Salop, on or before 10 a.m. on Tuesday the 8th day of February, 1927.
The Council do not bind themselves to accept the lowest or any Tender.
(Signed) J. A. HOLMES,
Solicitor, Clerk.
Clerk's Office, Oakengates, Salop. 4276

The Madras and Southern Mahratta Railway Company, Limited, 25, Buckingham Palace-road, Westminster, S.W. 1, invite TENDERS for :—
DUPLICATE PARTS FOR LOCOMOTIVES (HORN CHEEKS, CONNECTING RODS, CYLINDERS).
Tenders are due in on Tuesday, 11th January, 1927, by 3 p.m. Tender form obtainable at above address ; fee One Guinea, which is not returnable.
The Directors do not bind themselves to accept the lowest or any Tender. 4284

Borough of Watford.
APPOINTMENT OF ENGINEERING ASSISTANT FOR SEWERAGE WORKS.
APPLICATIONS are INVITED for the APPOINTMENT of SENIOR ENGINEERING ASSISTANT in connection with a Sewerage Scheme, which is estimated to take five years to complete.
Applicants must be Associate Members by examination of either the Institution of Civil Engineers or the Institution of Municipal and County Engineers and should also be good draughtsmen with considerable experience in the design of large sewerage works (including tunnel work in waterlogged ground and the construction of pumping stations and storage tanks), and in carrying the works out by contract.
The salary will be £375 per annum and the appointment will be terminable by one month's notice at any time.
Applications, stating age, qualifications and experience, together with names of two engineers to whom reference may be made, should reach the undersigned not later than Noon on Tuesday, the 11th January, 1927.
W. W. NEWMAN, A.M.I.C.E., F.S.I.,
Borough Engineer and Surveyor.
Municipal Offices, Watford. 4288

Commonwealth of Australia, Postmaster-General's Department.—TENDERS INVITED, Schedule V. 468, for the SUPPLY and INSTALLATION of PNEUMATIC TUBE SERVICE in Melbourne.—Tender forms obtainable from SUPPLY OFFICER, Australia House, Strand, W.C. 2. Tenders close 8th March, 1927. 4290

SITUATIONS OPEN

COPIES OF TESTIMONIALS, NOT ORIGINALS, UNLESS SPECIFICALLY REQUESTED.

WANTED, Civil Engineer First-rate SALESMAN, thoroughly experienced in Mining Compressed Air Machines, about 30-35 ; must be ready to go over to the States to travel and start business in the U.S.A. for a German firm of manufacturers ; some knowledge of German preferred. Good situation assured to the right man.
Write, with full particulars, stating age, full previous experience and references, salary required, &c., to BERNARD, 1, Boulevard Menilmontant, Paris XIe. P3588 A

APPLICATIONS are INVITED for the VACANCY of ASSISTANT CONSTRUCTIONAL ENGINEER, to act as Clerk of Works to Extensions to Large Electric Power Station.
Applicants must have had regular training and possess thorough knowledge of modern Generating Plant and have previously undertaken construction of new work.
Salary £500/600 per annum, according to qualifications, but salary will not be the deciding factor.
Address, stating age, training and references, 4294, The Engineer Office. 4294 A

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SITUATIONS OPEN (continued)

WANTED, ENGINEER REPRESENTATIVE.—GENERAL ENGINEERING and FOUNDRY COMPANY REQUIRES Full-time SALESMAN on salary and commission. Technical training and shop experience essential.—Address, P2596, The Engineer Office. P2596 A

ASSISTANT ENGINEER REQUIRED. University Degree and Contractors' or Erection experience. Not over 28 years of age.—Apply in first instance in writing, stating age, full particulars of training and experience, to BRUNNER, MOND and CO., Limited, Northwich, Cheshire. 4303 A

CEMENT WORKS ENGINEER WANTED for Cement Works in India. Must be competent to assist in construction. Prefer single man, age 28-35. Salary about 750 rupees monthly.—Written application only, giving full particulars of experience, to F. L. SMIDTH and CO., Ltd., Victoria Station House, S.W. 1. 4279 A

CHIEF ENGINEER REQUIRED for Skinningrove Iron and Steel Works.—Apply with full particulars, stating age, experience, and salary required, to PEASE and PARTNERS, Ltd., Darlington. 4311 A

FIRM of COMBUSTION ENGINEERS REQUIRE TWO experienced SALESMEN for Oil Firing Apparatus. State sales experience in detail. Salary £5 per week plus expenses and commission.—Address, 4315, The Engineer Office. 4315 A

TEA PLANTING.—An Important TEA COMPANY has a VACANCY on its European Staff for a YOUNG GENTLEMAN (aged 23-34 and unmarried), with engineering experience and preferably with a knowledge of Crude Oil Engines, to become a TEA PLANTER on its Gardens in Assam. The position would be under a three years' agreement, commencing from the date of arrival at the Gardens, and salary for the first year would be at the rate of Rs. 250 a month, rising by annual increments of Rs. 50 a month to Rs. 350 a month in the third year. Passage to the Gardens would be paid by the Company.—Applications should be addressed to Box "ASSAM," care of Davies and Co., 65, Bishopsgate, London, E.C. 2, and should contain full particulars as to age, education, and engineering experience. 4307 A

WANTED AT ONCE, ONE CHIEF DRAUGHTSMAN and THREE SENIOR DRAUGHTSMEN, with experience in design and lay-out of Cement Plants and Machinery. State experience, qualifications, and salary required.—Address, 4211, The Engineer Office. 4211 A

WANTED, Derbyshire, Practical DRAUGHTSMAN, age about 30, experienced design and operation of Crushing and Screening Plants. Full details of training, qualifications, experience (stating actual jobs done), and salary required.—Address, 4305, The Engineer Office. 4305 A

WANTED, Experienced DRAUGHTSMAN, Conversant with all types of Conveying and Elevating Plant and particularly expert in Structural Work. Competent to make out quickly accurate and detailed shop drawings and projections for assembly without erection. Must have first-class knowledge of up-to-date D.O. methods and latest machine design and qualified to design, detail and completely superintend large contracts. Age 35 to 40. When replying state salary required and tabulate experience.—Address, 4286, The Engineer Office. 4286 A

WANTED in a Railway Engineer's Office in Manchester, an experienced STEEL WORK DRAUGHTSMAN, able to make his own calculations.—Address, 4290, The Engineer Office. 4290 A

DESIGNING ENGINEER.—A Really First-class ENGINEER REQUIRED for the above position, with an important and well-known firm of British Engineers. Fullest details in strict confidence absolutely essential.—Address, 4308, The Engineer Office. 4308 A

DRAUGHTSMAN REQUIRED Temporarily; One accustomed to Gear Wheels of all descriptions, more particularly method of handling same during all machining operations.—Address, stating age, experience, and salary required, P2585, The Engineer Office. P2585 A

DRAUGHTSMAN WANTED, Experienced in Rotary Printing Press Work. Write particulars, experience, and wages required.—Address, 4259, The Engineer Office. 4259 A

DRAUGHTSMAN, with First-class Experience of Steam Turbine Design and Detail Work. State age, salary, experience, and when able to commence.—Address, 4200, The Engineer Office. 4200 A

DRAUGHTSMAN, with General Experience, REQUIRED for Structural Work in London office.—Address, stating experience, age, and salary required, P2600, The Engineer Office. P2600 A

MESSRS. DORMAN, LONG and CO., Ltd., Middlesbrough, REQUIRE ONE or TWO capable DRAUGHTSMEN, thoroughly experienced in designing and detailing Constructional Steel Work for all kinds of steel-framed buildings, bridge work, &c. Only first-class men, over 25 years of age, need apply. Permanent positions to suitable men.—Letters, stating age, experience, and salary required, to be addressed to the MANAGER, Messrs. Dorman, Long and Co., Ltd., Constructional Department, Middlesbrough. 4287 A

FITTER and MAINTENANCE MAN REQUIRED in Sutton district, accustomed to carrying out Repairs to Machinery, Belting, &c.; experience of Pipe Work essential, some knowledge of Turning an advantage.—Address, stating age, experience, with copies of references, P2593, The Engineer Office. Wages 1s. 4d. per hour. P2593 A

SITUATIONS WANTED

AN EXPERIENCED ENGINEER (35), 1st Class B.O.T., wide knowledge of all kinds of ships and small craft, steam and internal combustion engines, all types of boilers, auxiliary machinery, electric light, pumping plants, and refrigeration; ex chief engineer 10,000-ton liner and Engr. Lt.-Comdr. R.N. (Temp.), ex assistant manager of large salvage firm, also ex assistant supt. of large firm of dry dock, slipway and general engineers, good organiser and disciplinarian, excellent credentials, DESIRES responsible POSITION.—Address, P2586, The Engineer Office. P2586 B

CEMENT ENGINEER with Long Experience in Design and Construction of Cement Works at home and abroad DESIRES RESPONSIBLE POST.—Address, P2602, The Engineer Office. P2602 B

CIVIL AND MINING ENGINEER, with British and foreign experience in railway quarrying and mining work, public school, also engineering diploma, is now available for RE-ENGAGEMENT at home or abroad.—Address, P2588, The Engineer Office. P2588 B

ENGINEER, First Class B.O.T. Certificate, Experience in design, construction and running of marine Diesel engines, Super. or Charge.—Address, P2599, The Engineer Office. P2599 B

ENGINEER-SALESMAN MANAGER, with Shop, D.O. experience, late London repr. Midland firms, DESIRES APPOINTMENT with prospects. Young, energetic, smart appearance, guarantees increased sales. Services available immediately.—Address, P2589, The Engineer Office. P2589 B

HEATING ENGINEER MANAGER DESIRES CHANGE; used to all classes of work: steam, low-pressure hot water, pumped hot water, cooking, laundry, &c.; make own schemes, estimate and supervise erection.—Address, P2601, The Engineer Office. P2601 B

PRODUCTION, EXECUTIVE POSITION.—ENGINEER (34), comprehensive and responsible, high-class mass production experience, control design, planning, tools, piecework costs, equipment, &c.—Address, P2594, The Engineer Office. P2594 B

SITUATIONS WANTED (continued)

TECHNICALLY TRAINED ENGINEER "(27), 3 years' University training, 6 years works, D.O. and commercial exp., mechanical, combustion and steel work, DESIRES POSITION with prospects for sound technical abilities.—Address, P2598, The Engineer Office. P2598 B

COMBINATION of FIVE STRUCTURAL DRAUGHTSMEN, engagement terminating with first-class firm, INVITE OFFERS. All thoroughly conversant with competitive practice. Well worth consideration. Excellent references.—Address, P2592, The Engineer Office. P2592 B

JUNIOR DRAUGHTSMAN (21) SEEKS SITUATION with Engineers or Contractors; 6 years' experience shops, D.O. and abroad. Handling m/c and plant layout, &c.—Address, P2603, The Engineer Office. P2603 B

MECHANICAL DRAUGHTSMAN, with 20 Years' varied engineering experience, SEEKS POST. Good designer, neat and accurate worker.—Address, P2587, The Engineer Office. P2587 B

PARTNERSHIPS

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EDUCATIONAL

COACHING for INST. C.E. EXAMINATION, Personal or by correspondence.—To G. W. M. BOYCOTT, Assoc. M. Inst. C.E., 1, Orchard Drive, Blackheath, S.E. 3. 4150 B

CORRESPONDENCE COURSES for Inst. Civil Engineers, Inst. Mech. E., London Univ., and ALL ENGINEERING EXAMINATIONS, personally conducted by Mr. TREVOR W. PHILLIPS, B.Sc. (Honours), Eng., London, Assoc. M. Inst. C.E., Chartered Civil Engineer, M.R.S.I., F.R.S.A., &c. Excellent results at all Exams., comprising hundreds of successes. Courses may commence at any time.—Apply to Mr. TREVOR W. PHILLIPS, B.Sc. (Hons.), A.M.I.C.E., &c., 8/11, TRAFFORD CHAMBERS, 58, SOUTH JOHN-STREET, LIVERPOOL. Tel. No., Bank 1118.—London Office: 65, Chancery-lane, W.C. 2. Ex. B

CIVIL ENGINEERING CORRESPONDENCE COLLEGE.

CORRESPONDENCE TUITION for Institution of Civil Engineers Examinations.
New Prospectus, based on amended Institution Examination Syllabus, on application to
THE SECRETARY,
28, Noel-road, Edgbaston, Birmingham.
P2409 B

AGENCIES

SALESMAN WANTED by Established Manufacturers of High-grade Bright Bolts and Nuts, to sell on commission in North of England and Glasgow districts. Only those with sound connections amongst engineering, shipbuilding, electrical and locomotive engineers need apply.—Address, P2597, The Engineer Office. P2597 D

WELL-KNOWN GERMAN ENGINEERING FIRM, specialising in the manufacture of Precision Pneumatic Hammers, Riveters, Drilling Machines for Workshop Service, also Electric Drilling Machines, Grinding Machines, Lifting Magnets and Magnetic Clutches, Air Compressors, &c., WISHES to APPOINT influential and experienced SOLE AGENT for Great Britain or DISTRICT AGENTS. Remuneration would be by commission. Write fully in the first instance, stating experience and past and present activities.—Address, 4313, The Engineer Office. 4313 D

MISCELLANEOUS

MECHANICAL ENGINEER SPECIALISES in the DESIGN, PRACTICAL DEVELOPMENT and TESTING of NEW APPLIANCES and INVENTIONS under strict secrecy.—Write, BERTRAM JOY, A.M.I. Mech. E., 168, Regent-street, W. 1, or 'phone Regent 4829. 4317 I

MESSRS. S. DORABJEE and CO., Engineering Department, Teheran (Persia), will be pleased to RECEIVE CATALOGUES, PUBLICATIONS, AVAILABLE EXPORT PRICE LISTS, &c., of Manufactures in all Branches of Engineering. P2584 I

PATENTS

KING'S PATENT AGENCY, Ltd. (Director, B. T. KING, C.I.M.E., Registered Patent Agent, G.B., U.S., and Canada). Inventions advice handbook and consultations free. — 146A, Queen Victoria-street, London, E.C. 4. 40 years' refs. 'Phone: Central 6882. 3616 U

OPPORTUNITY TO ACQUIRE VALUABLE PATENTS.—ENGINEER, having fully developed and patented in important countries efficient ELECTRIC GAUGE to indicate contents of tanks—automobiles, bulk storage, ships, aircraft, reservoirs, &c.—will NEGOTIATE MANUFACTURING RIGHTS or SELL OUTRIGHT. Working models seen by appointment.—Address, 4248, The Engineer Office. 4248 H

THE PROPRIETOR of BRITISH PATENTS Nos. 205,000, dated January 25, 1923, and 219,397, dated February 24, 1923, relating to "Improvements in Electric-driven Pump and Blower Sets," and "Improvements in Oil Burner," respectively, is DESIROUS of ENTERING into ARRANGEMENTS by way of a LICENCE or otherwise on reasonable terms for the purpose of EXPLOITING the above patents and ensuring their practical working in Great Britain.—All inquiries to B. SINGER, Steger Building, Chicago, Illinois. 4268 H

THE PROPRIETOR of BRITISH PATENT No. 214,749, dated February 5, 1923, relating to "Improvements in Lathes," is DESIROUS of ENTERING into ARRANGEMENTS by way of a LICENCE or otherwise on reasonable terms for the purpose of EXPLOITING the above patent and ensuring its practical working in Great Britain.—All inquiries to be addressed to B. SINGER, Steger Building, Chicago, Illinois. 4263 H

THE PROPRIETOR of BRITISH PATENT No. 175,186, dated February 3, 1921, pertaining to "Improvements relating to the Cleaning and Ginning of Cotton," is DESIROUS of ENTERING into ARRANGEMENTS by way of a LICENCE or otherwise on reasonable terms for the purpose of EXPLOITING the above patent and ensuring its practical working in Great Britain.—All inquiries to be addressed to B. SINGER, Steger Building, Chicago, Illinois. 4264 H

THE PROPRIETOR of BRITISH PATENT No. 208,373, dated December 11, 1922, relating to "Improvements in Ventilator," is DESIROUS of ENTERING into ARRANGEMENTS by way of a LICENCE or otherwise on reasonable terms for the purpose of EXPLOITING the above patent and ensuring its practical working in Great Britain.—All inquiries to be addressed to B. SINGER, Woolworth Bldg., New York City, N.Y., U.S.A. 4156 H

THE PROPRIETOR of BRITISH PATENT No. 191,948, dated January 3, 1922, relating to "Improvement in Nut-cracking Machines," is DESIROUS of ENTERING into ARRANGEMENTS by way of a LICENCE or otherwise on reasonable terms for the purpose of EXPLOITING the above patent and ensuring its practical working in Great Britain.—All inquiries to be addressed to B. SINGER, Steger Building, Chicago, Illinois. 4293 H

THE PROPRIETOR of BRITISH PATENT No. 216,909, dated January 8, 1923, relating to "Improvements in Type-bar Making Machines," is DESIROUS of ENTERING into ARRANGEMENTS by way of a LICENCE or otherwise on reasonable terms for the purpose of EXPLOITING the above patent and ensuring its practical working in Great Britain.—All inquiries to be addressed to B. SINGER, Steger Building, Chicago, Illinois. 4295 H

THE PROPRIETORS of BRITISH PATENT No. 216,545, relating to "A Process for Separating the Constituents of Gases and Utilising them in Performing Work and Supporting Combustion," are DESIROUS of NEGOTIATING for the SALE of the PATENT or the GRANTING of LICENCES on reasonable terms.—Enquiries should be addressed to WM. BROOKES and SON, 5, Chancery-lane, London, W.C. 2. P2590 H

THE PROPRIETOR of BRITISH PATENT No. 123,080, dated 18th February, 1916, for "Electric Welding," is DESIROUS of DISPOSING of the PATENT RIGHTS or of NEGOTIATING for the GRANT of LICENCES to work thereunder.—All enquiries should be addressed to MEWBURN, ELLIS and CO., 70-72, Chancery-lane, London, W.C. 2. P2591 H

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THE PROPRIETORS of the Following BRITISH PATENTS DESIRE to INTRODUCE their INVENTIONS to the notice of Manufacturers and others with a view to the inventions being worked commercially under licence or otherwise.—All communications to be addressed to JENSEN and SON, Chartered Patent Agents, 77, Chancery-lane, London, W.C. 2.

197,631. "Improvements in or relating to Apparatus for Grinding or Surfacing Gear Blanks."
197,652. Ditto.
187,668. "Improvements in and connected with Gear Generating Machines."
201,126. "Improvements in or relating to Apparatus for Testing the Shape of Toothed Gears." 4321 H

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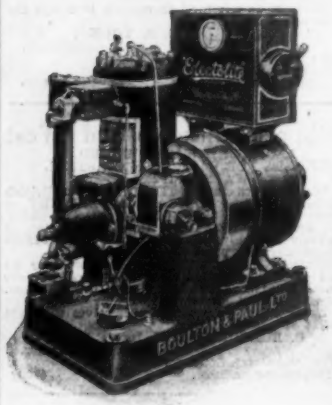

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For continuation of For Sale Advertisements see page 3.

A Seven-Day Journal

A Reconditioned Passenger Liner.

THE twin-screw passenger liner Orduna, a vessel of some 15,500 tons gross, originally built by Harland and Wolff, Ltd., in 1914, left Belfast last week for Liverpool after undergoing at her builders' yard a three months' period of overhauling and reconditioning. She ran successful trials, after which she was taken over by her owners, the Pacific Steam Navigation Company, Ltd., of London, who will use her on the South American service. Early in the New Year she is scheduled to sail from Liverpool on a voyage round South America. The main alterations to her machinery consisted in the conversion of her boilers from coal to oil burning, with the necessary rearrangement of bunkers and piping. As the ship recently saw service in the Atlantic trade, it was necessary to refit her accommodation for her present purpose. The old two-class, cabin and third class, accommodation has now been rearranged as first, second and third-class passenger quarters, each with their respective public rooms. In the first-class section of the ship state rooms and single and two-berth cabins have been introduced. The second-class cabins are mostly two and three-berth rooms, while good third-class accommodation in two subdivisions forward and aft has been provided for some 480 passengers. The ship has been renovated throughout and generally adapted to the requirements of the South American service in which she will now be engaged.

Television.

A FEW days ago we were invited to attend a demonstration of Mr. T. L. Baird's latest method of transmitting living scenes by television. As explained in THE ENGINEER of June 11th of this year, it was originally necessary to employ very powerful lights at the transmitting end, with the result that considerable discomfort was experienced by the sitter. During the past twelve months continual effort has been made to reduce this intense illumination, and it was finally decided to try the effect of using rays outside the visible spectrum. It is well known that ultra-violet rays have a strong photo-electric effect, but their dangerous action on the eyes and skin and the fact that these rays have a very low penetrative power rendered their use impracticable. Attention was therefore directed to the possibility of using the infra-red rays, which have no deleterious action on the human body and which, moreover, transcend in penetrative power the rays of the visible spectrum. This extreme penetrative power of the rays towards the lower end of the spectrum is well illustrated by the red glow of the setting sun, all rays except the red failing to penetrate the atmosphere. The use of these rays in conjunction with the "televisor" has enabled Mr. Baird to transmit living scenes without subjecting the sitter to discomfort. The person whose image is to be transmitted now sits in a totally dark room and facial movements, such as smiling, &c., are reproduced at the receiving end just as well as they were when the powerful lights were used. Mr. Baird believes that his new system will eventually lead to important developments in connection with warfare, for a beam of infra-red rays used in conjunction with his latest televisor would, he considers, render surprise night attacks impossible.

Transatlantic Wireless Telephony.

EARLY in January the Postmaster-General hopes to establish a preliminary Transatlantic wireless telephony service to and from the New York telephone area. For a conversation of three minutes' duration the charge will be £15, and each additional minute above the first three will be charged at the rate of £5. Experience has apparently indicated that there will be occasions, particularly in the late afternoon, when atmospheric conditions will prevent effective conversation, and allowance will be made in charging for individual calls when the conditions have been difficult. Details as to the method of booking calls will be announced later. Two-way conversation between this country and America was first attained on February 7th, 1926, whilst a month later a very successful demonstration was given to Press representatives in London and New York, when for four hours representatives of various journals talked from the Trunk Exchange, London, to their *confrères* in New York with perfect ease and clearness. Since that notable occasion further experiments have been in progress, and the results have apparently led the Post Office engineers to conclude that the system is now fit for commercial use.

The German Navy.

A SERIOUS accident occurred during the steam trials of the new German destroyer Moewe on the measured course near Pillau. While the vessel was running at full power the flange of the exhaust pipe on the forward condenser gave way, two men being scalded to death and three others fatally injured. The cause of the mishap has not yet been established. The Moewe, which was launched last March, is a boat of 800 tons, with turbine engines of 23,000 shaft horse-power and three oil-fired boilers, the designed speed being 33 knots. Five other boats of her class are now being completed afloat at Wilhelmshaven. Several German warships are at present engaged in "flag-showing" cruises abroad. The battleship Hannover has been visiting Madeira, the Canary Islands, St. Vincent, and Mediterranean ports. The cruiser Hamburg is on her way home after visiting the Far East. She is now at Alexandria, and will remain in the Mediterranean until the end of March. The new cruiser Emden has left Wilhelmshaven on a voyage round the world, with the object of exhibiting Germany's latest fighting ship in distant ports where no German naval vessel has been seen since the beginning of the war. A second cruiser of the "Emden" class is to be launched at Wilhelmshaven in the coming year, and two further ships of the same type are to be laid down at an early date. Upon the return of the Emden she is to be re-armed with eight 5·9in. guns of a new model, twin mounted on the centre line. Her present armament, which is provisional, consists of old guns mounted singly on the centre line and the broadside, as in consequence of Treaty restrictions on the manufacture of war material it was found impossible to deliver the new armament in time to be installed when the ship was ready for it.

Ancient British Bridges.

CONSIDERABLE progress, we learn, has been made by the Society for the Protection of Ancient Buildings, of 20, Buckingham-street, Adelphi, W.C. 2, in its task of making a survey of ancient British bridges with a view to forming a complete record of the old bridges which remain. Although this work was only begun last summer, up to two months ago no less than 500 bridges had been visited in the southern and western counties, of which nearly 200 were measured and recorded. The record shows that a great number of these bridges were stone structures which were built between the years 1750 and 1800. Of those measured seventy-six were built before 1750, of which fifteen were built with ribs, eight with semi-circular and seven with pointed arches. It is stated by the Society that the majority of the bridges visited were found to be in quite sound condition, in spite of the heavy modern traffic with which they are called upon to deal. In many cases, however, the roadway over the bridge is not more than 12ft. in width. If the necessary funds are available, it is hoped to complete next year the surveying of bridges in the South of England and in the Midlands as far north as Derbyshire.

Highway Engineering.

SOME time ago, as we duly recorded, the Worshipful Company of Paviors decided to raise a fund for the endowment of a Chair of Highway Engineering at London University. The scheme has now made considerable progress, and of the £30,000 required about £20,000 is assured. So far the transport industry has given little assistance to the scheme, and efforts are now to be made to obtain its support. The proposed Chair will be established either at King's or University College, London. The course of study to be provided will extend over three years and will follow the lines provided for the ordinary B.Sc. Eng. course, with modifications in the second and third year. The course will lead to the degree B.Sc. Highway Engineering. There will be an annual entrance examination, in connection with which two exhibitions of the value of £300 will be awarded. In connection with the final examination a gold medal and two bursaries of £50 will be open to the students. These bursaries are intended as contributions towards the cost of indentures with approved municipal or county engineers. Specialists are to be invited to deliver lectures, to the students taking the course, on quarrying, the chemistry of tars and bitumens, roadmaking materials and their physical testing, bridge construction, ferro-concrete work, sewerage and sewage disposal, road construction and maintenance, and other matters.

Safety in Coal Mines.

THE report of the Chief Inspector of Mines for the year 1925 reveals a slight decrease in the total number of accidents, fatal and non-fatal, as compared with the number which occurred in the mines of this country in 1924. The number of lives lost was 1128 and the number of workers injured 177,347, as contrasted with 1198 and 194,717 respectively in the preceding year. It would seem, however, that the reduction is in a sense fictitious, and is to be ascribed to a decrease in the numbers employed rather than to any exercise of increased care. On the basis of man-shifts worked the casualties in both categories were actually greater in 1925 than in 1924, although they were slightly less than in 1923. The Inspector calls attention to the number of accidents which occurred as a result of the use of naked lights in mines, in which little firedamp is normally found. Both the owners and the colliers argue that to use safety lamps instead of naked lights in these mines would result in more than an equivalent number of accidents from other causes, such as falls of roof and in haulage operations. This argument, the Inspector claims, has been proved to be unsound, but the law, he states, is not strong enough to enforce the change. Three explosions were caused during the year by the misuse of electrically driven coal-cutting machines. The Inspector believes that these machines can be operated with safety, but he insists upon the necessity for sound organisation, attention to the maintenance and working of the machines, and the provision of a generous ventilating current along all machine-worked faces. Nearly half the fatal casualties and about one-third of the cases of injury were caused by falls of ground. Commenting upon this fact, the Inspector expresses his surprise that the use of steel props is not general. The main reason why they are not widely employed is, he fears, the dislike of the mining community to adopting new devices. Many of the accidents occurring in connection with the haulage system, the use of explosives and on the surface were, the Inspector states, caused by carelessness or lack of discipline.

Shipbuilding on the Clyde.

THE detailed returns of the tonnage launched and the marine engines constructed in the Clyde shipyards during 1926 show that there was a marked reduction in output compared with the figures for previous years. This reduction, which was expected, is explained to a great extent by the delay in the supply of steel material and fuel consequent on the extended dispute in the coal trade. The 1926 figures show that 173 vessels were launched on the river, representing over 287,000 gross tons, and that the engine output was 427,000 indicated horse-power. In 1925 280 vessels were launched, with an aggregate of 523,000 gross tons, and with the exception of 1923, when there was a total of 128 vessels of 175,000 tons, the 1926 figure is the lowest since 1893. The highest output on the river for 1926 was that of Lithgows, Ltd., at Port-Glasgow, with ten ships totalling 63,325 tons. John Brown and Co., Ltd., of Clydebank, follow closely with three vessels aggregating 33,034 tons, while the Fairfield Shipbuilding and Engineering Company, Ltd., of Govan, also launched three vessels with a total of 22,886 tons, which figure was nearly reached by Harland and Wolff's Govan yard output of seven ships totalling 22,568 tons. The output of Lithgows, Ltd., of 63,325 tons is only surpassed by the combined output of the Govan and Belfast yards of Harland Wolff, Ltd., which amounted to 88,333 tons. If there had been no delay in the delivery of steel it is probable that Harland and Wolff, Ltd., would, for the fifth year in succession, have had the distinction of launching over 100,000 tons of shipping within the year.

The Airship R 100.

CONSIDERABLE criticism has been expressed of the decision, sanctioned by the Air Ministry, to have the gas bags for the airship R 100 made in Germany instead of in this country. This ship is now under construction by the Airship Guarantee Company, and the contract date for its completion is September, 1927. It will be finished about a year before the Government airship R 101 of similar size—5,000,000 cubic feet capacity—comes out of its shed at Cardington. The gas bags for the Government ship will be made at Cardington, and it is therefore argued that those for the R 100 might also be made there. There is no question of any shortage of goldbeaters' skin in this country or of inability on the part of British workmen to fabricate the bags. On the face of things the sole reason for placing the order in Germany is the matter of time of delivery. Why the original date for the completion should not be modified is, however, a question which some are asking. It is pointed out that in consenting to the use of Rolls-Royce "Condor" engines using petrol instead of the Ricardo heavy oil engines originally specified, the Air Ministry has already agreed to a modification of the contract of much greater significance than a short extension of the period allowed for the construction of the airship. It is stated that the change made in the engines will necessitate the engine cars being loaded with ballast in order that the designed stressing of the members of the airship's structure may not be affected.

Further Trials of the King George V.

WHEN describing the machinery of the high-pressure geared-turbine Clyde steamer King George V. in our issue of September 17th, we mentioned that after the close of the tourist season, opportunity would be taken to carry out exhaustive consumption trials. In the week before Christmas these trials were completed, and a further demonstration was run with representatives of shipowning firms and marine-engine builders on board. In our description of the vessel above referred to, we commented on the heat in the engine-room and the difficulties experienced in ventilating it. This matter has now been taken in hand, and on the recent demonstration trial the coolness of the engine-room was very noticeable. The details of the extended consumption trials will be given in a paper which is to be read before the North-East Coast Institution of Engineers and Shipbuilders early in January. It was mentioned at the luncheon during the demonstration run, that the results anticipated had been realised, both as regards steam consumption and the efficiency of the boilers. We are informed that the efficiency of the Yarrow high-pressure boilers when hand fired with Polmaise coal worked out at 80 per cent.

The Sulzer 1500 lb. Boiler.

IN our issue of June 4th last we published a full description of the 800 lb. boilers installed in the Langerbrugge power station in Belgium, and now, by the courtesy of Messrs. Sulzer Brothers, we are able to give our readers the first particulars to be made public concerning a boiler plant which is being operated in the Sulzer works at Winterthur at nearly double that pressure. For many years Messrs. Sulzer Brothers have enjoyed a reputation as first-class boilermakers, and since the war they have constructed a number of boilers for working pressures up to 480 lb. per square inch, and in sizes up to 14,000 square feet of heating surface in a single unit. Foreseeing the demand for still higher pressures, they decided to put themselves in a position to supply boilers which could be operated with safety and satisfaction at any pressure likely to be called for by engineers of the most advanced ideas. It has always been the custom of the firm to develop new designs in its own works, and at its own risk, rather than to experiment at the expense of its customers, and in accordance with that policy it set about the construction of the boiler we are about to describe.

A working pressure of 110 atmospheres, or 1565 lb. gauge per square inch, was decided on, with a total steam temperature of 707 deg. Fah. Steam under these conditions has a total heat, according to Callendar's tables, of 1232·8 B.Th.U. per lb. Its available heat when expanding down to a 29in. vacuum is 452 B.Th.U. per lb., giving a Rankine efficiency of 38·1 per cent. With steam generated at this pressure, and taking advantage of modern regenerative and reheating cycles, a steam turbine plant can compete with the internal combustion engine on its own ground, namely, that of fuel economy, while retaining the peculiar mechanical advantages inherent in a small, light and non-reciprocating prime mover, capable of being constructed to develop any power required.,

The primary object of the construction of the Sulzer boiler was to acquire experience in the generation and use of steam at extra high pressures. The boiler was erected in the winter of 1925–26, and serves to supply steam for certain manufacturing processes, as well as for heating a certain part of the workshops. The latter duty implies practically continuous operation, so that the durability of the boiler itself and of its fittings and auxiliary apparatus will be thoroughly tested. The boiler consists of two separate steam-raising units, one of which works at the full pressure of 110 atmospheres (1565 lb.) and a steam temperature of 375 deg. Cent. (707 deg. Fah.), while the other works at 14 atmospheres, or practically 200 lb. per square inch, with a steam temperature of 350 deg. Cent., or 662 deg. Fah. The two parts are not entirely distinct, as the low-pressure part serves, in a manner which will be explained later, as a feed-water heater for the high-pressure part. The principal object of the arrangement chosen was to study the practicability of improving an existing low-pressure boiler plant by the addition of boilers working at much higher pressures.

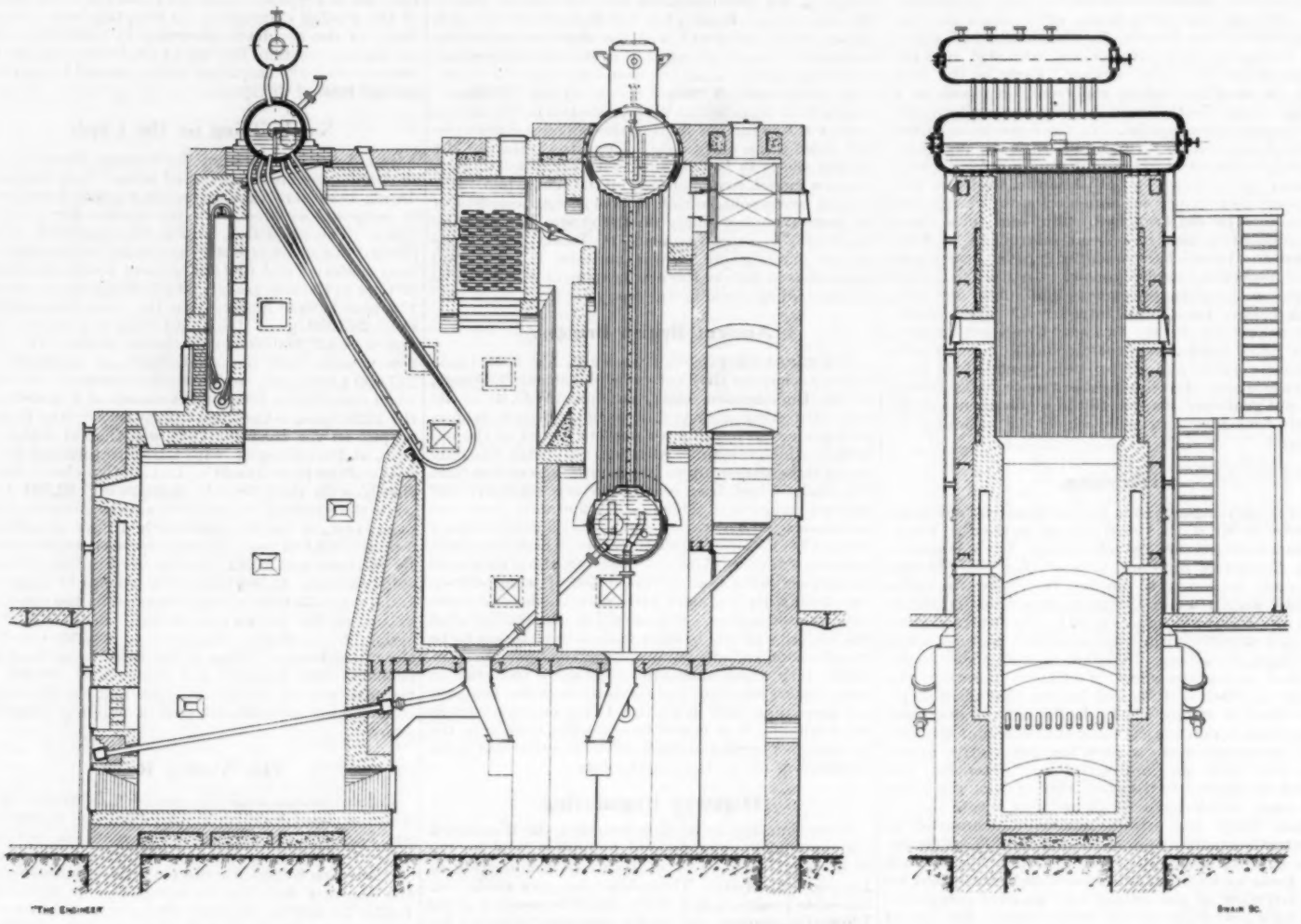


FIG. 1—CROSS SECTIONS THROUGH 1500 LB. BOILER

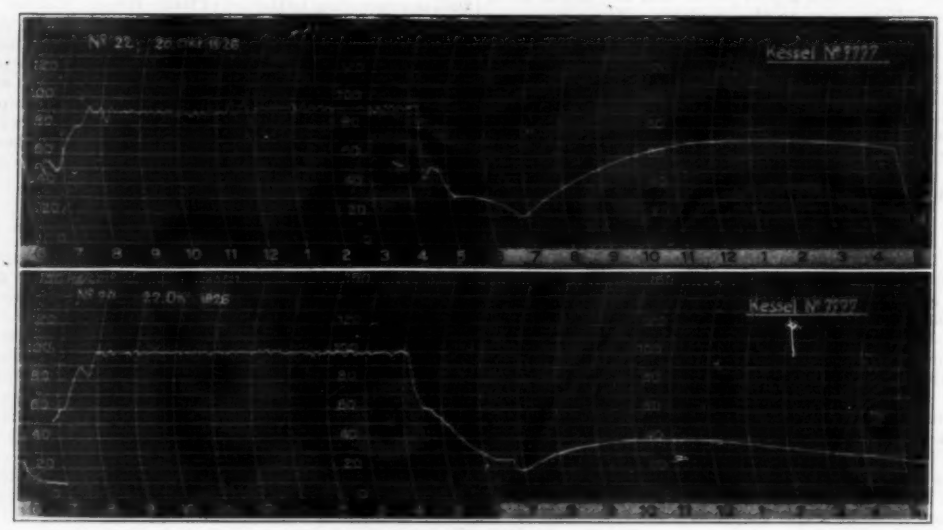


FIG. 2—STEAM PRESSURE GAUGE RECORDS

Sections through the complete boiler unit are given in the drawing Fig. 1. Firing is effected by pulverised coal, on the unit system, the pulveriser being of the high-speed beater type and delivering the coal dust direct to the burner. The latter, arranged almost vertically in the arch of the combustion chamber, is of rectangular section, and the air for combustion can be introduced either through the burner or through orifices at the sides of the chamber. Below the coal burner is placed an oil burner which facilitates ignition of the coal when starting from cold. Across the bottom of the combustion chamber is a water screen composed of eleven 3in. seamless tubes expanded into square headers and connected to the low-pressure part of the boiler. The object of this screen is to chill the falling particles of molten ash and slag, so that they fall as dust instead of caking on the floor of the furnace and forming a deposit of clinker difficult to remove when the boiler is in service.

The front and side walls of the furnace are cooled with air which circulates several times up and down in closed ducts before passing eventually to the air heater. A pipe connects the latter directly with the burner. The air heater is arranged at the back of the low-pressure boiler, and an induced draught fan situated on top of the boiler creates the necessary draught. Both the high-pressure and the low-pressure parts of the boiler are fitted with separate superheaters. The high-pressure superheater, as will be seen by Fig. 1, is designed as a radiant heat superheater, and is built into the front wall opposite the high-pressure boiler tubes. The low-pressure superheater is of the usual construction and lies between

the two parts of the boiler; it can be by-passed if desired.

The heating surfaces and other particulars of the boiler unit are as follows:—

High-pressure boiler	45 sq. m. (485 sq. ft.)
Low-pressure boiler	115 sq. m. (1240 sq. ft.)
High-pressure superheater	8 sq. m. (86 sq. ft.)
Low-pressure superheater	40 sq. m. (430 sq. ft.)
Air heater, about	180 sq. m. (1940 sq. ft.)
Water screen, about	9 sq. m. (95 sq. ft.)
Furnace volume	42 c.m. (1485 c. ft.)
High-pressure boiler, normal capacity, per hour	3600 kilos. (7900 lb.)
Low-pressure boiler, normal capacity, per hour	2000 kilos. (4400 lb.)

High-pressure Side.

The high-pressure part of the boiler comprises a seamless drum, into which are expanded the ends of the U-shaped tubes forming the heating surface. Above the main drum is a smaller one, connected to it by a number of upright tubes, and constituting a steam collector. The drums were forged from solid ingots by Messrs. Krupp, the ends being closed in after the forgings had been machined inside and out. The material is 5 per cent. nickel steel, having an ultimate tensile strength of 30 to 37 tons per square inch, and an elastic limit at 20 deg. Cent. of 22 tons per square inch.

The chief particulars of the drums are given in the following table:—

High-pressure drum—	
Internal diameter	900 mm. (36in.)
Wall thickness	73 mm. (2·9in.)
Thickness at manhole	117 mm. (4·6in.)
Total length	4260 mm. (14·0ft.)
Approximate weight	8600 kilos. (8·5 tons)
Steam collector—	
Internal diameter	700 mm. (28in.)
Wall thickness	53 mm. (2·08in.)
Thickness at manhole	85 mm. (3·35in.)
Total length	3000 mm. (9ft. 10in.)
Weight	3400 kilos. (3·4 tons)

There are twenty-four seamless high-pressure water tubes, with an external diameter of 60 mm. (2·36in.) and a wall thickness of 7 mm. (0·276in.). The average length of these tubes is 12·8 m. (42ft.). Both ends of each water tube are beaded into the high-pressure drum. The tubes are seamless hot-rolled Mannesmann tubes, tested to 200 atmospheres (2845 lb. per square inch), and are of specially selected quality, having a tensile strength of 24 to 29 tons per square inch, with a minimum elongation of about 20 per cent. The tubes of the high-pressure superheater are of the same material. They are 32 mm. (1·26in.) external diameter and 3·5 mm. (0·138in.) thick. The drums were submitted to thorough tests at the makers' works, and later by Messrs. Sulzer at Winterthur. Besides the usual tests made to verify the tensile strength and elongation, special bending and notched bar tests were also made by both parties. Finally, very conclusive measurements were made of the stress and strain in the drums under hydraulic pressure. Before putting the drums in hand tests were also made of the strength of the joints made by beading tubes into thick plates.

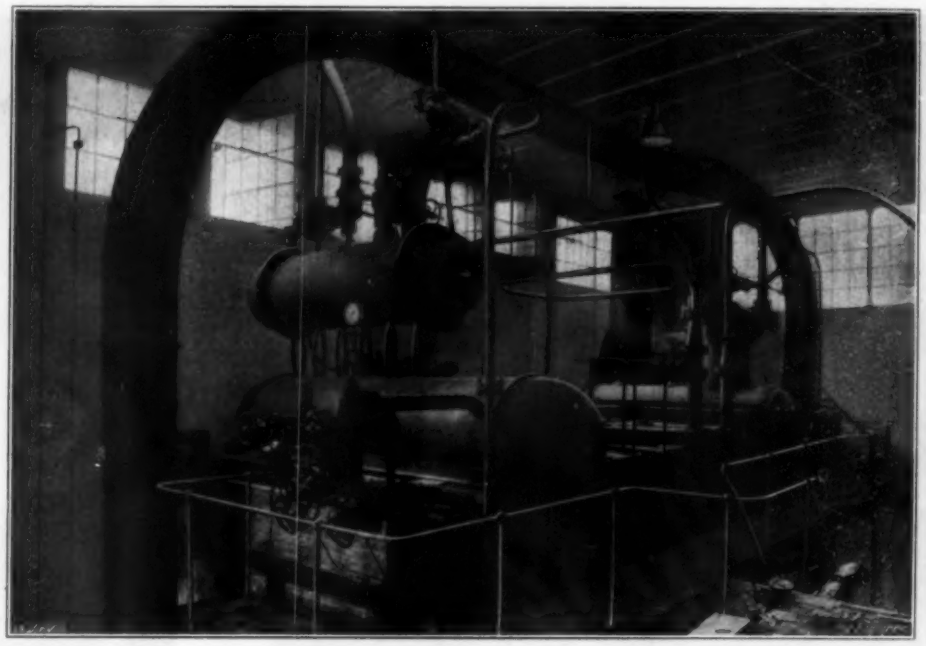


FIG. 4—TOP OF BOILER SHOWING OVERHEAD DUCT FROM AIR HEATER TO BURNER

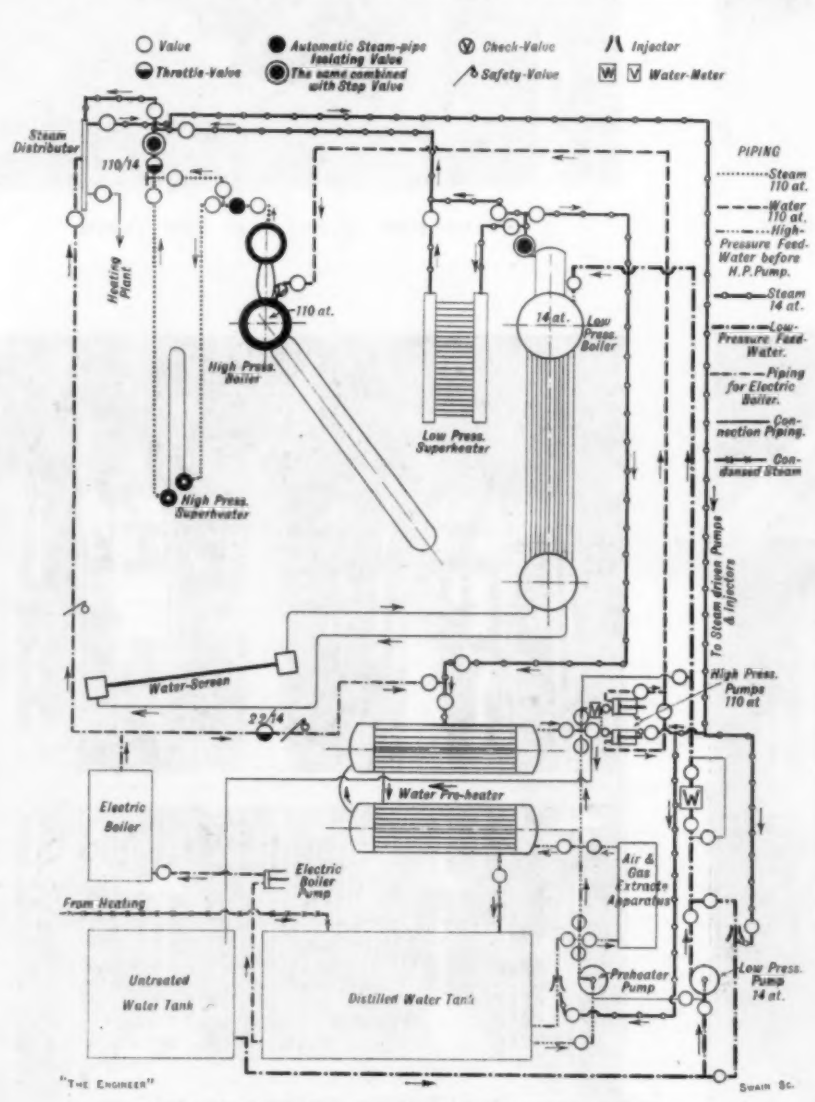


FIG. 3—DIAGRAMMATIC ARRANGEMENT OF 1500 LB. BOILER

The normal rate of evaporation of the high-pressure part of the boiler unit is 80 kilos. of steam per square metre, or 16·38 lb. per square foot. This high rating allows a small heating surface to be adopted. It must be remembered that the high-pressure boiler tubes are exposed both to intense radiant heat, and also to the direct contact of the hottest gases immediately leaving the furnace. Under these conditions a rate of evaporation considerably greater than the average rate of all the tubes of an ordinary boiler is to be expected. Furthermore, the reception of the heat by the water in the tubes is better than in the case of an ordinary boiler, because the steam bubbles are smaller or fewer. Steam at 1560 lb. per square inch gauge pressure has a specific volume of only about 0·326 cubic foot per lb., whereas at 200 lb. pressure the specific volume is about 2·158 cubic feet per lb., or over six times as great.

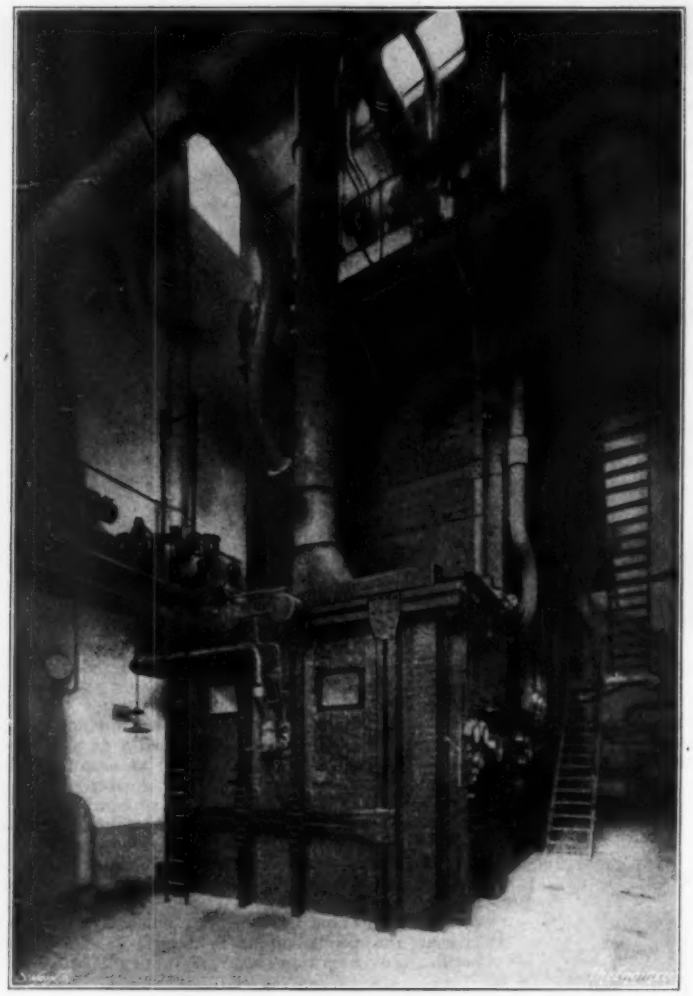
General Arrangement.

Fig. 3 shows diagrammatically the arrangement of the plant. The raw water is obtained from the Winterthur town mains, and has a total hardness of about 22 French degrees. After preliminary treatment in a Sulzer purifier, it enters the raw water tank shown in the left-hand bottom corner of the diagram. From this tank it is fed into the low-pressure boiler by means of a low-pressure centrifugal pump working against a pressure of 14 atmospheres. The make-up feed for the high-pressure boiler, which amounts to about 5 per cent. of the high-pressure steam produced, is provided as follows:—The required amount of saturated steam from the low-pressure boiler passes down into a pre-heater, having the form of a surface condenser. The steam is condensed in this apparatus, and passes from it into the distilled water tank. The water from this tank, which has a capacity of about 20 cubic metres, or 4400 gallons, is the water which serves to condense the steam in the preheaters. The bulk of the water in this tank is the condensate from the high-pressure steam after use. This water is forced by a centrifugal pump working at a pressure of 230 lb. per square inch, through the de-gasser and through the preheater to the suction side of the high-pressure feed pumps. In passing through the preheater it is raised to a temperature of about 190 deg. Cent., and is fed into the high-pressure boiler at that temperature by the high-pressure feed pumps. There are two of these pumps, each capable of supplying the boiler at full load with adequate feed water at a pressure of 120 atmospheres, or 1700 lb. per square inch. One of the pumps is steam driven and the other is electrically driven, an oil gear being fitted between the pump and motor in the latter case in order to avoid the necessity for a variable speed motor. When used for heating purposes the steam from the high-pressure boiler is passed through a reducing valve into the steam distributor and thence to the heating system. The condensate from the system flows back to the distilled water tank, thus completing the circuit. The surplus steam raised in the low-pressure boiler can also be used in the heating system, both the high-pressure and the low-pressure steam being led away together after passing the reducing valve. When the low-pressure steam is used in this way, the low-pressure boiler can, of course, be fed with distilled water, except for the amount of make-up required.

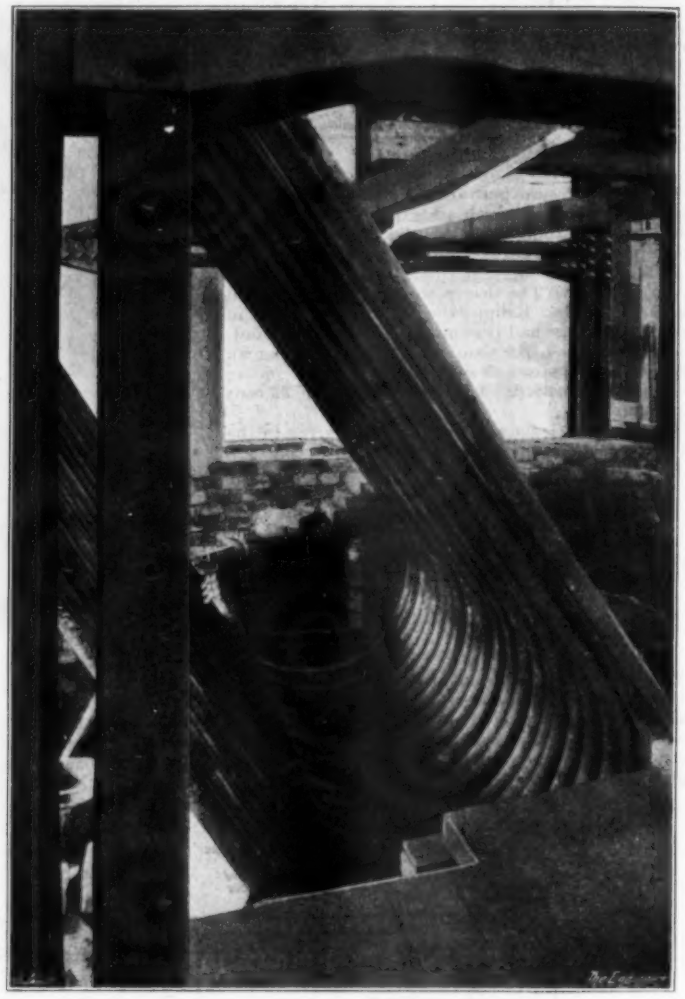
The general appearance of the boiler unit and of its auxiliaries will be well gathered from the illustrations on page 708 and herewith; whilst Fig. 2 shows reproductions of a pair of actual records from the

1500 LB. STEAM BOILER

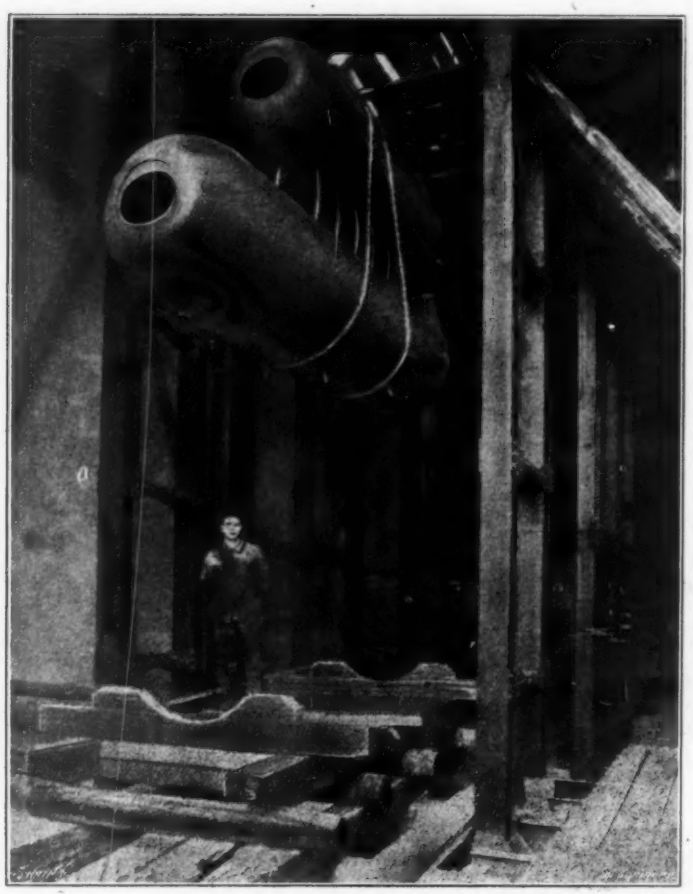
SULZER BROTHERS, WINTERTHUR, SWITZERLAND, ENGINEERS



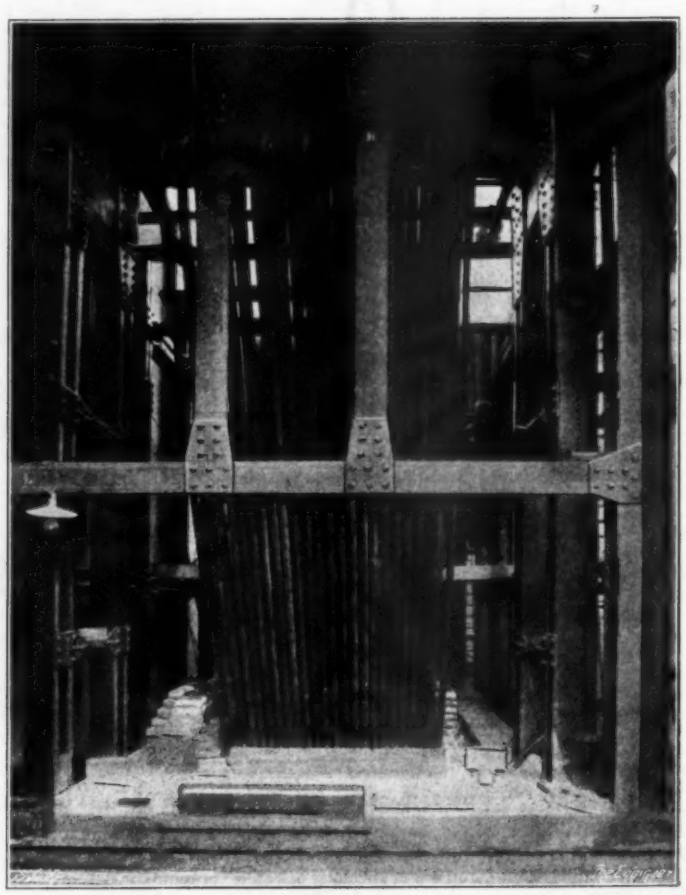
COMPLETE BOILER, PULVERISED FUEL FURNACE IN FOREGROUND



WATER TUBES OF H.P. BOILER BEING ERECTED



H.P. DRUM AND STEAM COLLECTOR BEING ERECTED



HIGH-PRESSURE BOILER, VIEW FROM FRONT

pressure gauge. The records refer to October 20th and 22nd, 1926, when eight-hour runs were made during the night hours. It will be seen that on the first night the pressure rose from about 1280 lb. to 1350 lb. per square inch during the run, while on the second night it was maintained with wonderful steadiness at 1565 lb. for the whole eight hours. In the table we give the data recorded on seven tests of the Sulzer boiler unit. All the tests lasted for eight hours, and one for nine hours, so that the errors due to starting and stopping conditions may be considered negligible. The pressure of the high-pressure boiler was raised step by step from 694 lb. to 1448 lb. per square inch as the tests proceeded, and the rate of evaporation was also increased. The tests were only preliminary, but they were quite sufficient to show that the plant was fully equal to the work for which it was designed, and that the general design was perfectly satisfactory.

Tests with High-pressure Boiler.

Sulzer Brothers, Winterthur, Switzerland.

Heating surfaces.—High-pressure: Boiler, 45 sq. m. = 485 sq. ft.; superheater 8 sq. m. = 85 sq. ft.
Low-pressure: Boiler, 115 sq. m. = 1240 sq. ft.; superheater, 40 sq. m. = 430 sq. ft.
Water screen: 9 sq. m. = 95 sq. ft.; air heater, 180 sq. m. = 1940 sq. ft.

No. of test	2	3	6	7	10	11	12
Duration of test, hours	9	8	8	8	8	8	8
Calorific value of coal, k.-cal/kilos.	7,500	7,500	7,500	7,500	7,590	7,590	7,590
B.Th.U./lb.	13,500	13,500	13,500	13,500	13,660	13,660	13,660
Coal per hour, kilos.	516	480	508	561	566	590	630
lb.	1,135	1,056	1,118	1,234	1,245	1,298	1,386
High-pressure boiler—							
Average pressure, kilos./sq. cm.	48·8	64·5	83·7	91·1	93·5	100·9	101·8
lb./sq. in.	694	917	1,190	1,296	1,330	1,435	1,448
Water evaporated per hour, kilos.	2,494	2,318	3,108	3,353	3,031	3,167	3,344
lb.	5,478	5,100	6,838	7,377	6,668	6,967	7,357
kilos./sq. m.	55·4	51·5	69·0	74·5	69·5	70·4	74·3
lb./sq. ft.	11·4	10·6	14·1	15·3	14·2	14·4	15·2
Temperature of superheated steam, deg. Cent.	272	310	319	320	Without superheater		
deg. Fah.	522	590	606	608	Without superheater		
Low-pressure boiler—							
Average pressure, kilos./sq. cm.	11·9	12·3	12·0	12·0	13·4	13·3	13·2
lb./sq. in.	170	175	171	171	191	189	188
Water evaporated per hour, kilos.	1,630	1,493	1,634	1,667	1,863	2,080	2,089
lb.	3,586	3,285	3,595	3,667	4,099	4,576	4,596
Water evaporated per hour and sq. m., kilos.	14·1	13·0	14·2	14·5	15·5	17·3	17·4
Water evaporated per hour and sq. ft., lb.	2·89	2·66	2·91	2·97	3·17	3·54	3·56
Gas temperature leaving boiler, deg. Cent.	340	303	290	304	326	332	325
deg. Fah.	644	577	554	579	619	630	617
Temperature of superheated steam, deg. Cent.	286	293	290	310	299	292	297
deg. Fah.	547	559	554	590	570	558	567

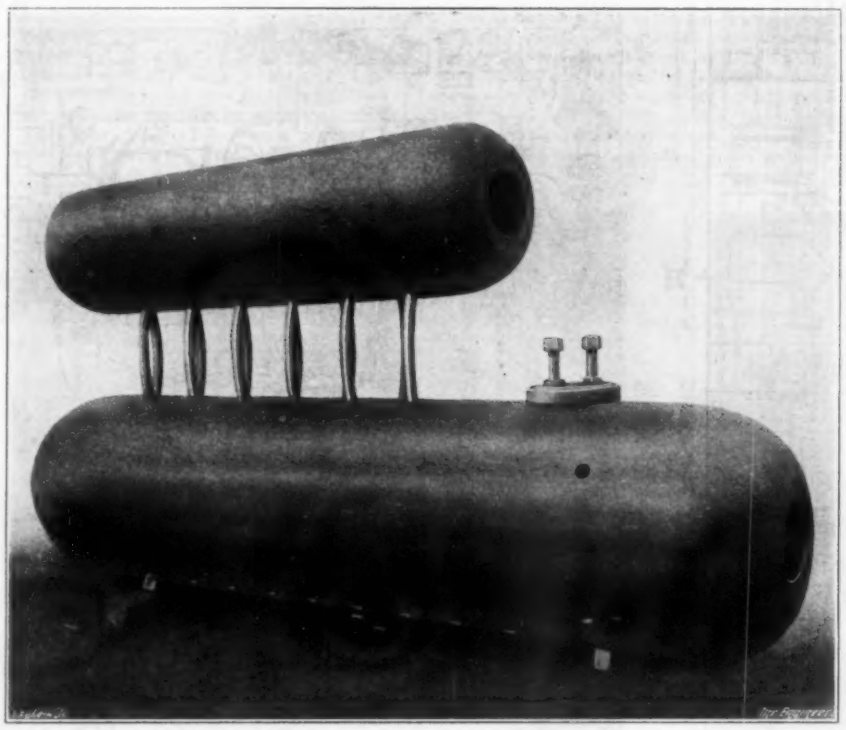


FIG. 5—HIGH-PRESSURE DRUM AND STEAM COLLECTOR OF 1500 lb. BOILER

CONCLUSION.

As we have already stated, the leading idea in the construction of a boiler consisting of a high-pressure and a low-pressure section was to explore the possibilities of improving existing low-pressure plants. But there were other considerations which indicated the advisability of such a procedure. The low-pressure section, which is obviously much less costly than the high-pressure portion, is quite adequate to extract the heat from the partially spent flue gases. Thus the two-pressure system avoids the installation of expensive high-pressure heating surface in the region of low gas temperatures, where the rate of heat transmission is low and the surfaces therefore have to be correspondingly large. The low-pressure boiler can provide these large surfaces without undue cost, leaving for the high-pressure boiler the duty of intensive heat absorption where the temperatures are greatest. The low-pressure boiler, moreover, provides, as has been seen, a distilled feed water at a very high temperature for the high-pressure boiler, and thus at the same time preserves the latter boiler, protects it from scale, and relieves it, as far as possible, from the work of warming water.

We have to thank Messrs. Sulzer Brothers for permission to describe this notable enterprise in boiler construction, the development of which will be looked forward to with interest by all who are concerned in the evolution of steam plant.

New Mining Practice in S. Africa.

THE advantage of clean mining over a narrow stope width has been known to mining engineers for a long time, but up to recently there has been no attempt to carry the principles into effect upon a large scale, or to establish them as a policy of the gold mining industry. The success which has attended the well thought out and systematic plan at the Sub-Nigel Gold Mine will no doubt lead to its being widely adopted where the conditions are favourable. The conditions of the Sub-Nigel property, on the Far East Rand, are no doubt specially suited to the system, although up to a year ago the prevailing system of low cost per ton of ore as the chief aim of operations had been adhered to. The general policy of crushing a huge tonnage so as to get a low working cost, even if waste rock, or at all events unpayable rock, is crushed, has no doubt sprung from the difficulty of supplying the huge plants which have been erected at a good many mines with sufficient ore to keep them at full work.

Of course, the reason why the narrow reef produces the larger profit is because in that instance a naturally concentrated ore is being dealt with, and there is, therefore, a smaller volume of ore to tram, hoist, break, mill, treat and dump. Investigation, however, has shown that in most cases the economic limit of the resuing system—in the "resuing" system the shale footwall is first stoped out and a clear floor obtained, and then the clean ore is blasted down—is a reef width of 24in. Above that limit the ordinary stoping system gives increased profit, as the reef width increases. It must, however, be remembered that the capital expenditure on milling and hoisting plant would be very considerably increased in the case of the greater reef widths.

The alteration which the new policy has made in the position of the Sub-Nigel Mine will be best understood if some extracts from the consulting engineer's report for the year ended June 30th, 1926, are given. It must, however, be pointed out that there has also been a marked increase in the values obtained in development, both as regards value and percentage of payable ore being encountered. It may also be well to show the position of the mine at September 30th, 1925, and at September 30th, 1926. During September, 1925, the Sub-Nigel crushed 10,500 tons, yielding 6875 oz., or 13·095 dwt. per ton. Revenue was £29,132; working costs, 39s. 3d. per ton; profit, £8526. During September, 1926, the mine crushed 11,500 tons, yielding 10,028 oz.; revenue, £42,493; working costs, 43s. 5·1d.; profit, £17,525. The following is quoted from the consulting engineer's report:—"A notable feature of the year's working has been the reduction in the stoping width, which averaged 26·4in., as compared with 35·9in. for the preceding year. This reduction has largely accounted for the increase in the gold recovered per ton milled, which is the highest recorded for the mine.

"The ore reserve fully developed at June 30th, 1926, is estimated at 731,000 mine tons of an average value of 17·5 dwt. over an estimated stoping width of 28in. This gives an increase over last year's figures of 222,000 tons, the value being higher by 5·3 dwt., and the stoping width lower by 11·2in. After deducting 17 per cent. for surface sorting, a milling tonnage of 606,730, of an average value of 20·9 dwt., per ton is obtained. Included in the ore reserve for the year are certain blocks of ground which were previously classified as unpayable, but which have now been brought within the pay limit by the reduction of stoping width. The addition of this tonnage, although reducing the value of the total reserve, has largely compensated for the loss of tonnage due to the reduction in stoping widths of the majority of the previous year's ore reserve blocks. The ground developed during the year in No. 1 shaft area accounts for the increase of tonnage, and is responsible for the maintenance of the average inch-dwt. of the reserve, notwithstanding the inclusion of the above low grade tonnage.

"Development results have been of more than usual interest, and continue to show improvement, both as regards value and percentage of payable ore being encountered. The total development footage accomplished was 13,393, of which 10,135ft. were sampled. Of the footage sampled 6875ft., or 67·8 per cent., showed payable values averaging 57·8 dwt. over a reef width of 17·5in., equivalent to 1012 inch-dwt., or 25·3 dwt. over an estimated stoping width of 40in. Owing to the continued reduction in stoping width, a new basis for estimating same, for development returns, has been adopted from the beginning of the current financial year. The stoping width is now calculated as reef width plus 12in., with a minimum of 24in. when the reef width is under 12in. The development returns for the year if taken on this basis would give a payable footage of 7025, or 69·3 per cent., showing an average value of 32·9 over 30·2in.

"Although not connected with the narrow stoping policy, it may be of interest to mining men to learn that during this year the Sub-Nigel has obtained from Government a provisional lease over 2373 claims on the farm Grootfontein adjoining the northern boundary of the property, and on the direct line of the apparent extension of pay shoots. The capital of the company has been reorganised in terms of the tender, and the extension of the plant to treat 18,000 to 20,000 tons per month commenced. This additional area puts the Sub-Nigel in the position of having the largest unworked area of ground of any mine in South Africa.

"Under the terms of the tender the company is allowed four months in which to carry out development work in the southern portion of the lease area, before deciding whether the sinking of another shaft is warranted. In order to obtain the information as quickly as possible two points of attack are being rapidly advanced from the No. 1 shaft twenty-fifth level. These two ends are placed about 1200ft. apart, and are known as the 25–6 Haulage and the 25–4 Winze. The 25–6 Haulage is expected to penetrate the ground of the lease area during November, 1926, when driving east will connect with the 25–4 Winze. This haulage is being advanced on reef, and the exposures have been rather erratic in value. Very good values have, however, been met with in the 25–4 Winze, which is being put down on the line of the pay shoot exposed on the twenty-fifth Level East Drive, and is at present the lowest point of the workings. At June 30th, 1926, this winze had been advanced 480ft. below the twenty-fifth level, and sampling over this distance gave an average value of 63·5 dwt. over a reef width of 17·2in., equivalent to 1092 inch-dwt. The development results on the lower levels have, throughout the year, more than maintained the progressive increase in values, which have been such a striking feature during the past few years, as greater depth has been reached. The importance of these results is in the definite indication they give of the general improvement in tenor as the lease area is approached."

It may be stated, in conclusion, that all stoping in the mine is done with jackhammers. The average stoping width for the year for all stopes was 26·4in., and stopes with narrow reef widths have been worked to as low as 16in. This was made possible by having systematic stope tracks cut in the footwall from 20ft. to 30ft. apart, and carried right up to the face. Resuing of some slopes with narrow reef widths is being done, giving a mill width as low as 10in. in some cases. It is impossible to overrate the importance of the jackhammer in the new policy, for it is that machine's ability to work very narrow stopes that has been one of the biggest factors. Some weeks ago, with two of these machines in a Far East Rand stope, a performance of 9·4 fathoms per machine shift was obtained and it was only possible to run the machines for twenty-two shifts in the month owing to the other operations in the stope, lashing and support of hanging, being unable to keep pace with the rate of advance of the face and the quantity of ground broken.

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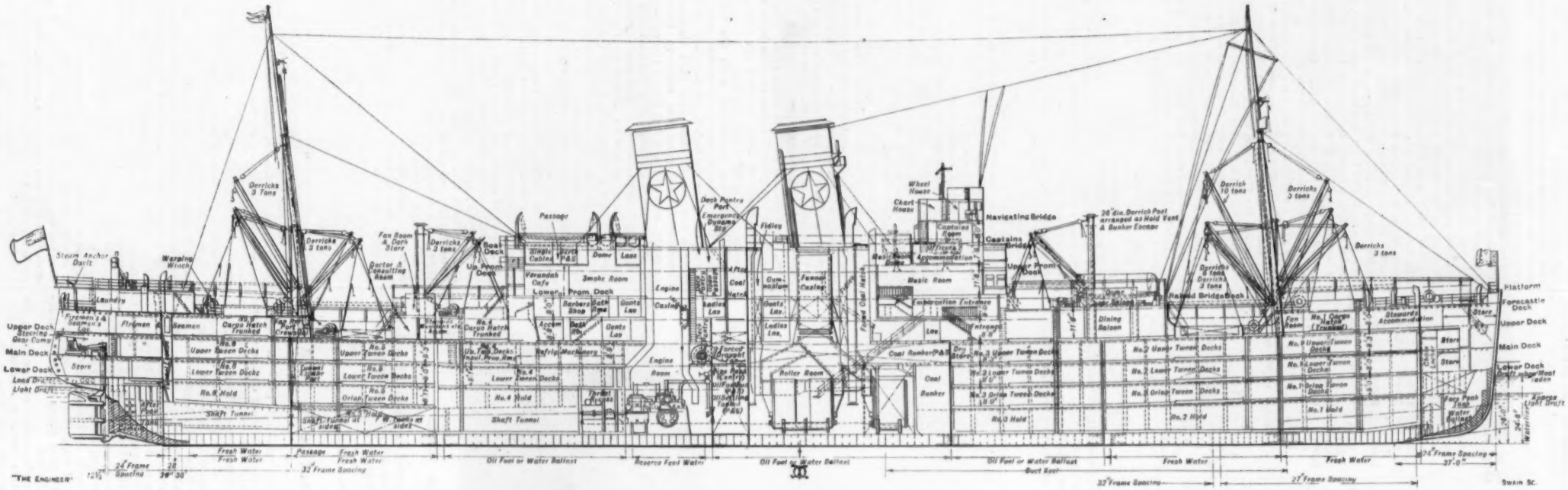
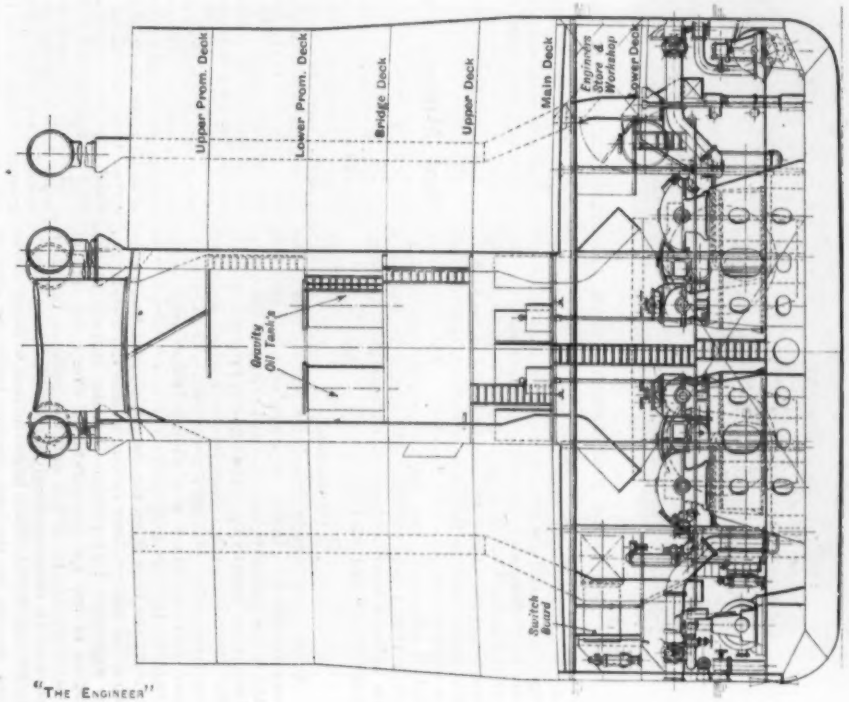
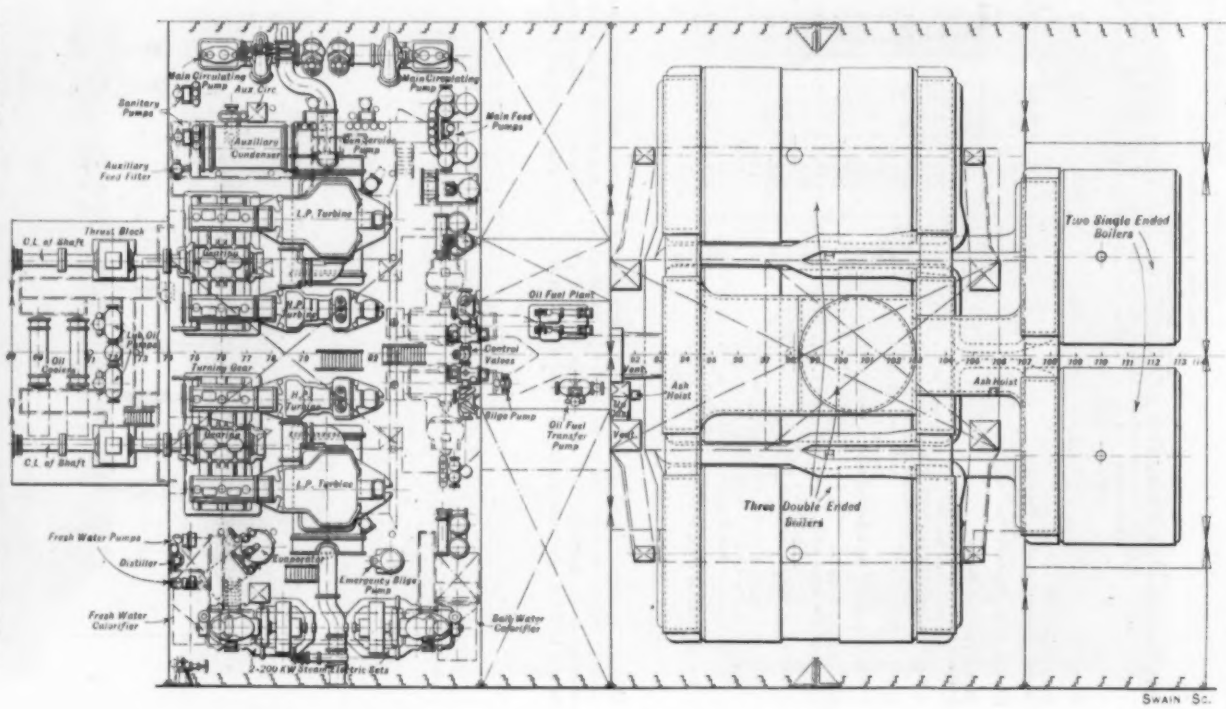
THE BLUE STAR LINER ALMEDA

CAMMELL LAIRD AND CO., LTD., BIRKENHEAD, BUILDERS AND ENGINEERS

(For description see opposite page)

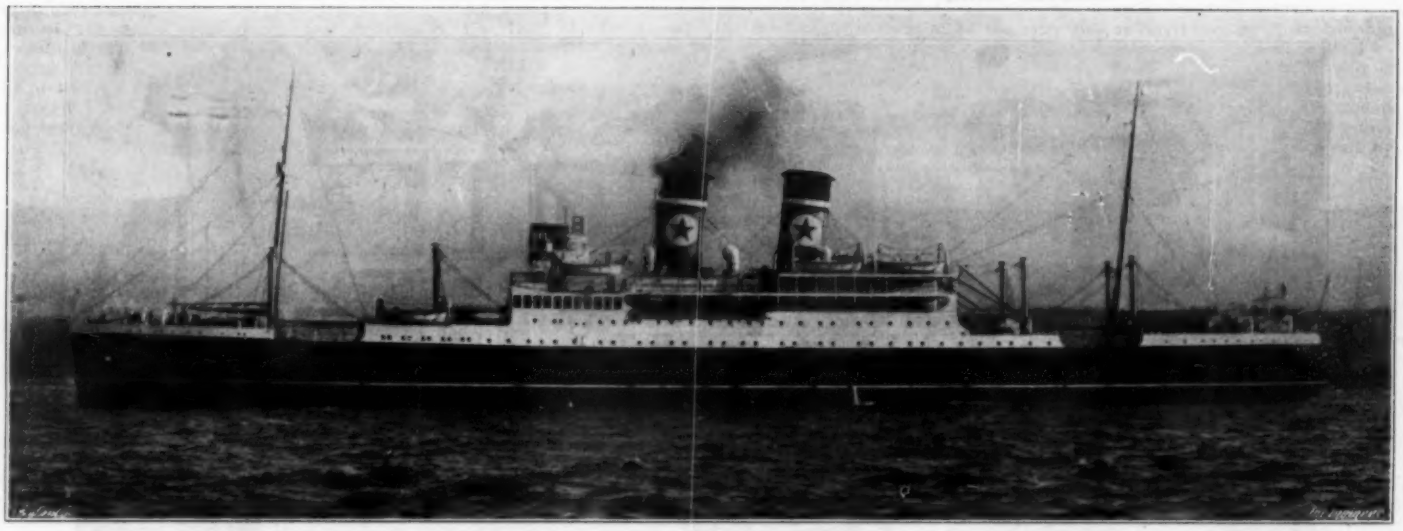






THE BLUE STAR LINER ALMEDA

CAMMELL LAIRD AND CO., LTD., BIRKENHEAD, BUILDERS AND ENGINEERS



The Blue Star Liner Almeda.

THE Blue Star liner Almeda, which was recently completed by Cammell Laird and Co., Ltd., at Birkenhead, and which sailed from Tilbury towards the end of this month, instituted a new fortnightly service between London and South America. With the new steamers, Buenos Aires will be reached in eighteen to nineteen days, the ships calling at Lisbon, Madeira, Rio de Janeiro, Santos and Montevideo *en route*. The Almeda is the first to be completed of five similar passenger and cargo steamers, which, together with four cargo ships, were ordered last year by Lord Vestey and Sir Edmund Vestey for the Blue Star Line (1920), Ltd. Three ships, it will be remembered, were placed with Cammell Laird and Co., Ltd. The Andalusia, one of the sister ships of the Almeda is at present being fitted out, whilst a third, the Arandora, is on the stocks, and will be launched early in the New Year. Two other vessels are approaching completion at the Clydebank yard of John Brown and Co., Ltd., Glasgow.

The Almeda was successfully launched by Lady Vestey on June 29th, and by the end of November she was ready for trials. The trials, to which we shall refer later, were carried out on the Clyde, and after a successful run the vessel returned to Liverpool before sailing for London on December 10th. While at Liverpool we were permitted, by the courtesy of her owners and builders, to inspect her passenger accommodation and machinery arrangements, of which an illustrated description is given in this and a later article, which will deal more especially with the refrigerating machinery and equipment.

We reproduce above a broadside view of the ship taken in the Mersey. It shows her very neat and trim appearance. She has, it will be seen, a straight stem and a cruiser stern, with two pole masts. Fore and aft are four derrick posts, with derricks and winch gear serving the six cargo hatches. The colouring of the funnels, which is indicated to some extent by our illustration, is peculiar to the passenger carrying ships of the Blue Star Line. There is a broad band of black at the top with a narrower band of white at its bottom, while below the black, on the red ground of the funnel, a large blue star is painted, on a circular white background. The design is at once noteworthy and distinctive.

The vessel is constructed of Siemens-Martin mild steel, and has been designed to meet the requirements of the highest classification of Lloyd's Register of Shipping. In addition, her subdivision and safety appliances are in full accordance with the Board of Trade requirements. Propelling machinery of the twin-screw single-reduction geared turbine type is fitted, steam being supplied from five cylindrical boilers. The principal hull measurements and particulars are as follows :—

Hull.

Length between perpendiculars	510ft.
Breadth moulded	68ft.
Depth moulded	37ft. 3in.
Displacement	23,000 tons
Gross tonnage	14,000

Passenger and Cargo Capacities.

Number of passengers	180
Type of accommodation	First-class *de luxe*
Total refrigerated capacity	440,000 cub. ft.

Propelling Machinery.

Type	Twin-screw, single-reduction, geared turbines
Total designed output	7600 S.H.P.
Turbine speed	2200 r.p.m.
Propeller speed	120 r.p.m.
Designed ship's speed	16 knots
Number of boilers	Three D.E. and two S.E.
Working pressure	200 lb. per sq. inch
Auxiliary generating sets	Two 200-K.W. steam driven

It will be seen from the drawing on page 710 that there are seven decks on the ship, of which four are continuous. All 'tween deck spaces below the upper deck are insulated and are equipped for the carrying of meat cargoes.

PASSENGER ACCOMMODATION.

The passenger and officers' accommodation on the Almeda is conveniently arranged on the four upper decks, namely, the upper deck, the bridge deck and the lower and upper promenade decks. In a passenger liner of the Almeda's tonnage as usually designed, the space referred to would in all probability be laid out for some 400 passengers. On the ship we are describing, which only carries 180 passengers, more than double the room is thus available for each person. This wise policy is at once appreciated when the public rooms and cabin and deck spaces are seen. We do not remember a ship with more spacious accommodation and decks. Again, a personal note has been introduced into the decorative schemes for all the new liners, by entrusting this work to Sir Charles Allom, yachtsman and decorative artist, who, we understand, has personally supervised the work.

FIG. 1—MUSIC ROOM AND LOUNGE

FIG. 2—DINING SALOON

The entrance hall is on the bridge deck, and is panelled in eighteenth century style. Main companion ways lead down to the dining saloon on the deck below and up to the music room or lounge on the lower promenade deck. On either side of the entrance hall at the forward end of the bridge deck are two private suites, comprising a vestibule sitting-room and bedroom and bathroom, which are carried out in a Louis XVI. period design. The walls are panelled and the furniture is painted to match the very soft pink and grey green tints of the respective suites.

Fig. 1 is a view in the lounge and music room, looking aft. In the centre underneath the dome a fine tapestry panel has now been hung. The engraving also shows the wrought iron balustrading of the main companionways, with the gilt bronze handrails. This is a very pleasant room in French style. It is well lighted in the daytime by side windows and a dome over the staircase. The walls and columns are finished in a soft reseda tint and the windows are hung with curtains of rose and silver damask. A carpet of old ivory harmonises with the green and rose broçades of the furniture. In Fig. 2 a view of the dining saloon is shown. It runs the full width of the upper deck and small tables with comfortable chairs after a French model are used. An eighteenth

THE BLUE STAR LINER ALMEDA

CAMMELL LAIRD AND CO., LTD., BIRKENHEAD, BUILDERS AND ENGINEERS

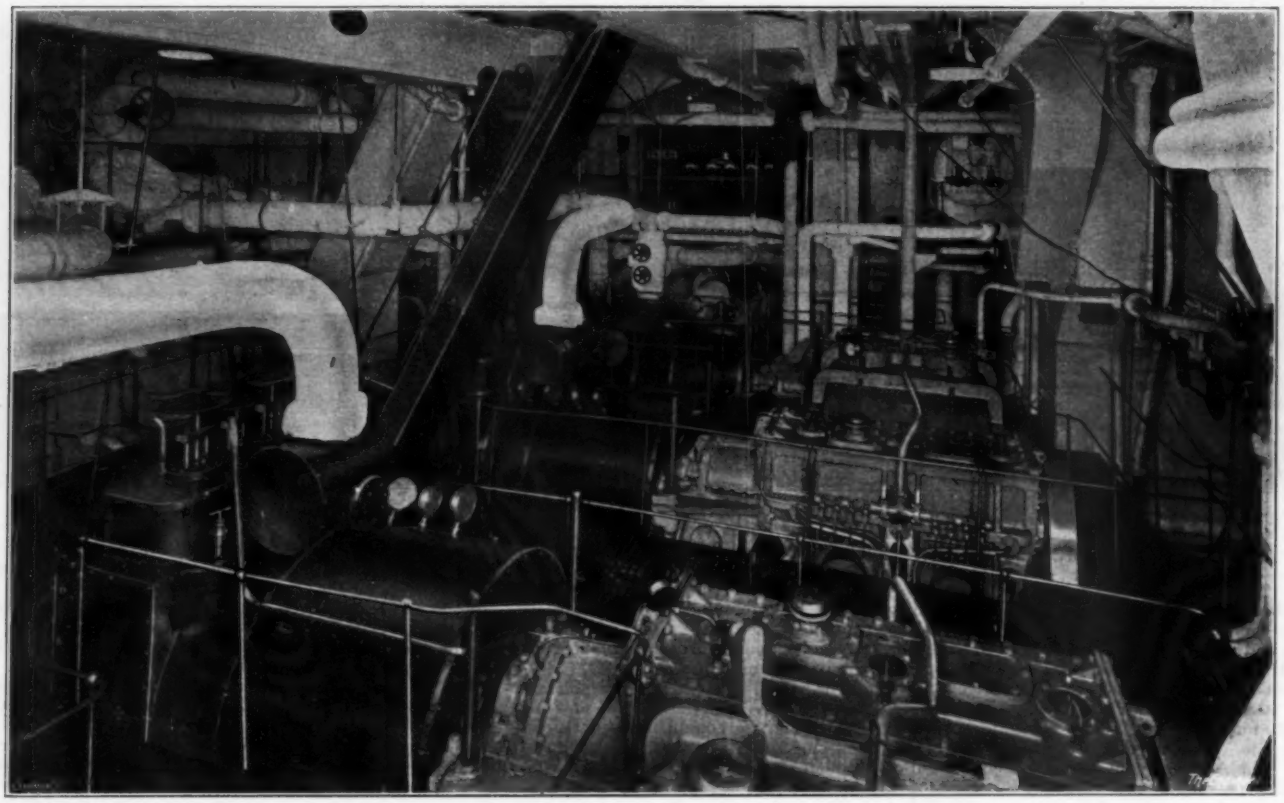


FIG. 6—GENERAL VIEW OF ENGINE ROOM LOOKING TO STARBOARD

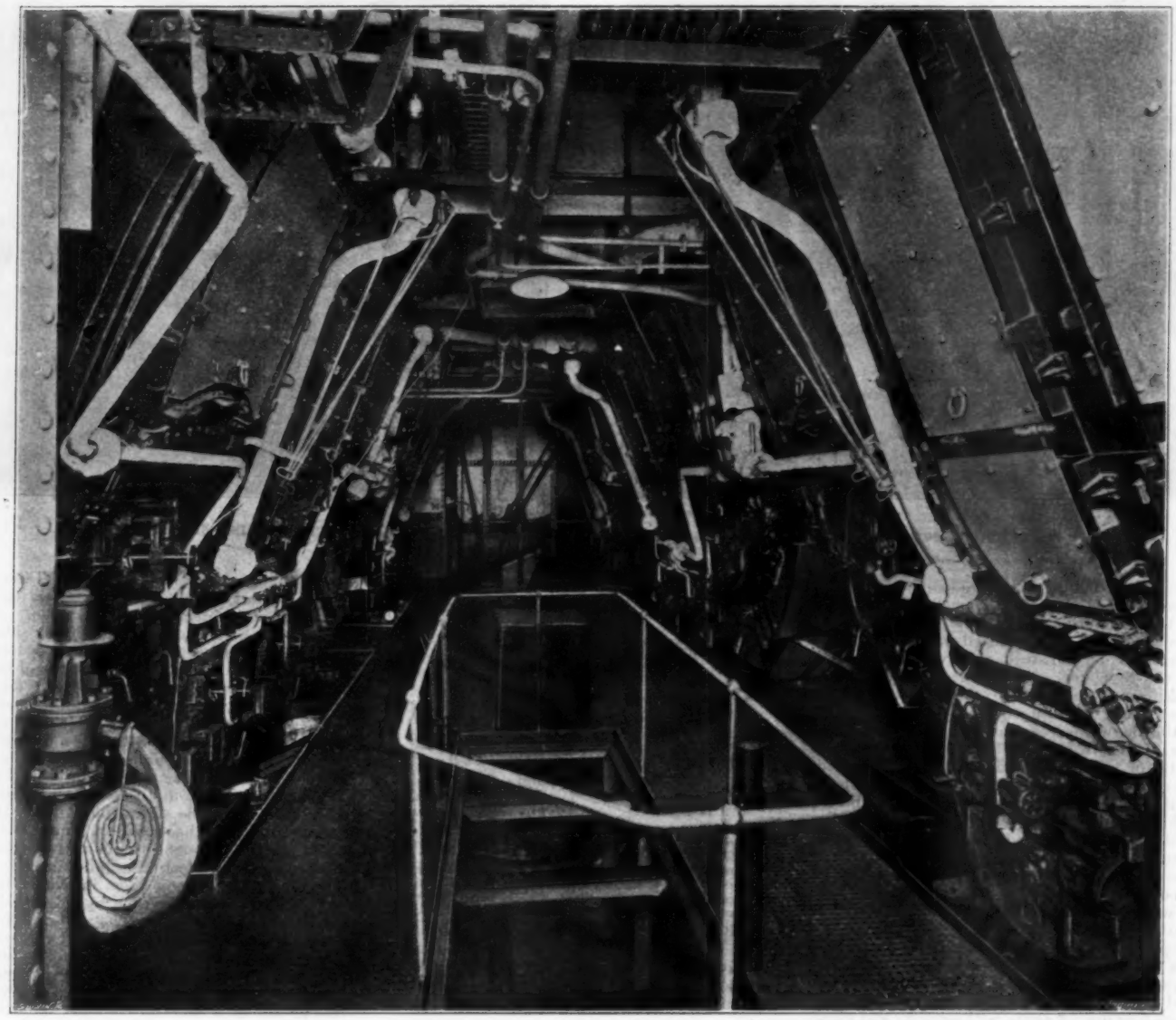


FIG. 7—VIEW IN STOKEHOLD

century French style has been adopted with rose and stone colour as the predominating notes. Again the room is lighted in the day by an overhead dome and oval-shaped side lights, while semi-concealed electric lights and candelabra fittings give a pleasing effect in the evening.

One of the most comfortable and artistically arranged rooms in the ship is undoubtedly the smoking-room, shown in Fig. 3, which is at the after end of the promenade deck. As our illustration indicates, it is panelled, walnut-wood of a rich brown colour having been chosen both for the walls and the four pillars. The furniture is reproduced mainly after

FIG. 3—SMOKING ROOM

FIG. 4—EN SUITE STATE ROOM

William and Mary period designs, and it adds distinctly to the decorative scheme. The panelling is enriched with old gold decorations, and the curtains of buff and moss green harmonise with a fine carpet of the same green tint. Leading off from the smoking-room is the verandah café, which, by means of sliding partitions, can be opened to give an excellent view to the sides and towards the stern of the vessel. The decorations take the form of a pergola with vines, and the effect is distinctive. There is no doubt that this room will prove to be a favourite part of the ship.

One may remark perhaps on the loftiness of the rooms, a height of 11ft. 6in. being chosen for those we have described. The vessel is well provided with open deck spaces, both on the lower and upper promenade decks, which can be employed for walking or games as required.

Our illustration, Fig. 4, shows a typical *en suite* state-room. A noteworthy feature of all the cabin spaces is the total absence of girders and plating in the finished scheme. All ceilings are filled in and the effect, as shown by Fig. 4, is very pleasing. A general plan, which is followed in many of the rooms, is to place the two beds, one at either end, with the two wash basins fitted with hot and cold water at the centre. Most of the wardrobes are let into the wall spaces, so that a more than usual amount of floor space is provided; moreover, many of the state-rooms are fully 20ft. in length. There are thirteen two-berth state-rooms, which are each provided with private bathrooms. Particular attention has been given to the bathroom accommodation and equipment generally, most of which has been furnished by Shanks and Co., Ltd., of Barrhead, Glasgow. In all, the total number of bathrooms will suffice to provide one for every four passengers carried. Some of the state-rooms are grouped for the use of family parties. We understand that the decoration and furnishing of the public rooms throughout the ship was carried out by Waring and Gillow, Ltd., of London.

The ship is fitted with up-to-date safety and navigational arrangements. Lifeboat accommodation is provided for all persons on board, with the usual provision of motor lifeboats.

The boats are supported on Welin type davits. In the passenger accommodation fireproof partitions are fitted at intervals, with hinged doors of fireproofed wood. On the poop deck there are two hospitals, and there is also a well-equipped dispensary and doctor's consulting-room at the after end of the bridge accommodation on the upper deck.

On the upper deck aft there are also the crew's quarters, which are fitted out very comfortably, galvanised iron berths being provided. There are separate mess-rooms for the various sections, and electric light is installed throughout. The engineer officers are accommodated in convenient quarters on the starboard side of the upper deck, while the deck officers' and wireless operators' cabins are right forward on the upper promenade deck.

DECK AUXILIARIES AND GENERAL EQUIPMENT.

As may be judged from our drawing on page 710, a large number of derricks and some twenty-three steam winches, most of them 7in. by 12in., are provided for the quick handling of the meat cargoes. The winches near to the passenger accommodation, eight in number, are of a special silent running type. All winches were supplied by John H. Wilson and Co., Ltd., of Birkenhead. On the forecastle deck a powerful steam windlass is provided for working the anchors and cables. The steam steering gear is of the Wilson-Pirrie type, and is controlled from the navigation bridge by telemotor gear, and may also be operated by hand wheel from the docking bridge aft.

Reference may also be made to the excellent equipment of the kitchens and pantries. The ranges are for the most part oil fired, and they were supplied by Henry Wilson and Co., Ltd., of Cornhill Works, Liverpool. In the bakery there is a water-tube oven and an electric dough mixer, whilst we noted that the pantries are furnished with hot presses, electric toasters and many other ingenious devices for maintaining an efficient kitchen service. There is a separate galley for the crew.

We may refer briefly to the heating and ventilation of the ship, which has been specially designed to meet the requirements of a vessel engaged in the South American service. In the state-rooms, dining saloon, kitchens and their dependencies, in addition to the customary cabin bracket fans, fresh air is supplied directly by high-pressure fans, while lavatories, bathrooms and kitchens are ventilated by high-pressure exhausting fans. For the main stairways, music and smoking-rooms propeller exhaust fans of the ceiling type are provided. In addition to the equipment already mentioned, we noted that in the state-rooms and the dining saloon fresh air at a high pressure is delivered through neat directional louvres, supplied by the Winsor Engineering Company. The fitting referred to is one by means of which the occupants of a state-room can alter the amount of air supplied and its direction at will.

Steam heating is employed throughout the accommodation spaces, each state-room having a radiator fitted which can be directly controlled by the passengers. In the case of the public rooms, the radiators are concealed, and are arranged so that the warm air is circulated in the apartments through grilles which are let into the walls.

In the present article we shall only refer in passing to the very fine refrigerating machinery equipment which is fitted in this ship. It was supplied by the Liverpool Refrigeration Company, Ltd., and is, we believe, the largest marine installation yet built. The insulation of the forty-nine compartments for meat carrying, aggregating some 440,000 cubic feet of refrigerated cargo space, was carried out by the builders on the "panel system" to the designs of Mr. E. A. Thomson, the senior superintendent of the Blue Star Line (1920), Ltd. In the special compartment devoted to the refrigerating machinery there are two 7½in. by 21in. CO_2 compressors, each driven from the tail-rod of a tandem steam engine. We shall refer to this equipment in detail in the course of a later article.

MAIN PROPELLING MACHINERY.

The drawings we reproduce on page 710 show the general lay-out of the propelling machinery and engine-room auxiliaries, whilst on the opposite page, in Figs. 6 and 7, we give views taken athwartship in the engine and boiler rooms respectively. The Almeda was engined by her builders, and the machinery consists of two sets of Parsons impulse and reaction type turbines, with a designed shaft horse-power of 7600 at a normal speed of 2200 revolutions per minute, which drive the twin screws of the vessel at a speed of 120 revolutions per minute through single reduction gearing. As will be seen from the drawings on page 710, each unit comprises one high-pressure ahead and one low-pressure ahead turbine, which are connected by flexible couplings to pinions which engage the main gear wheel. In Fig. 6 the turbines are shown to the left of the picture and the gear cases to the right are coloured in a lighter tint. In each low-pressure turbine casing there is incorporated an astern turbine

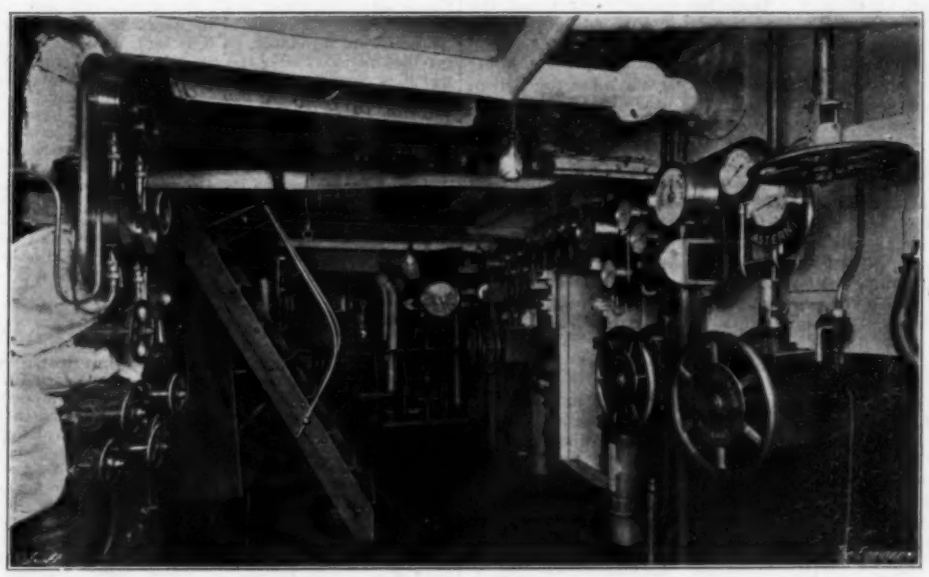


FIG. 5—ENGINE-ROOM STARTING PLATFORM

of the impulse and reaction type. The gear cases are mounted on stools, that allow the main condensers, which are boat-shaped in section, to be undershung from the low-pressure turbines. On the port side of the ship there is also an auxiliary condenser of the circular type. Turning gears are fitted at the after end of the gear cases, whilst further aft are the Michell type thrust blocks in the thrust space, which also serves to accommodate the lubricating oil pumps and coolers. Steam is supplied to the main turbines at a gauge pressure of 200 lb. per square inch from three double-ended and two single-ended marine type boilers, which work under forced draught on the Howden system. The forced draught fans, which were built by James Howden and Co., Ltd., of Glasgow, and are electrically driven from direct coupled General Electric motors, are neatly housed in a space on main deck level directly above the forward end of the engine-room, to which access is obtained from the engine-room hatch. The boilers, as shown in Fig. 7, are equipped for oil fuel burning on the Thornycroft system, but they can be converted to burn coal if so desired, the necessary bunker facilities and ash conveyors being provided.

We show in Fig. 5 a view of the control station on the starting platform. The view is looking to port, and it will be seen that the gauges, control valve hand wheels, telegraph, &c., are conveniently grouped on the forward bulkhead of the engine-room and also on the other side of the gangway below the turbines. At the side of the stairway a desk is arranged for the use of the engineer on watch. There is a platform at mid-gear level, which extends all round the turbines, and is shown in Fig. 6 on page 712. This view, which is taken looking to starboard, also indicates the position of the raised switchboard, while the overhead girders and lifting blocks can also be seen. On the port side of the ship there is an engineers' store and workshop, which is provided with machine tools supplied by Louden Brothers, Ltd., of Glasgow.

With the exception of the electrically driven forced draught fans already referred to, also an electrically-operated emergency bilge pump by Drysdale and Co., Ltd., of Glasgow, the main auxiliaries are steam driven. Their arrangement is shown on page 710, and they comprise air, feed, oil fuel, transfer and forced lubricating oil pumps, also a direct-contact feed heater by G. and J. Weir, Ltd., of Cathcart; bilge, ballast, sanitary and fresh-water pumps, by Thom, Lamont and Co., Ltd., of Paisley; and filters, surface heater and evaporator, by Hocking and Co., Ltd., of Liverpool.

The two electric generating sets are on the starboard side of the ship, and they are each designed for an output of 200 kilowatts. The engines, built by W. H. Allen, Sons and Co., Ltd., of Bedford, are of the compound type, with 15½in. and 32in. cylinders, with a stroke of 10in. They are designed for an output of 390 brake horse-power at a normal speed of 375 revolutions per minute when supplied with steam at a gauge pressure of 150 lb. per square inch. The engines are direct coupled to 220-volt direct-current generators by the General Electric Company, Ltd., of Witton. As we have already remarked, the public rooms are well lighted, according to most modern practice, while for emergency boat lighting and cargo-handling, high-candle-power flood lights are provided. A 24-kilowatt paraffin oil engine driven generator set is fitted on the upper promenade deck to provide current for wireless telegraphy and emergency purposes, should the main engine-room sets be at any time put out of service.

We may briefly refer to the extended bell and telephone service, also the loud-speaking telephones, which are installed throughout the vessel. The wiring is run on the surface, and for the inside accommodation a lead-covered white-braided cable is employed. For the machinery spaces and other positions in which the cable might be damaged, lead-covered, armoured and braided cables are employed.

TRIAL RESULTS.

We are informed by the builders that the trials which were run on the measured mile at Skelmorlie, gave results which showed that the Almeda was in every way satisfactory. The speed on the measured mile was, we learn, considerably in excess of the contract speed of 16 knots, while the behaviour of the ship at sea during her voyage to and from the Clyde was all that could be desired.

Apart from running the speed trials, an opportunity was taken to test the vessel in every way, and both in manœuvring and in other respects she more than fulfilled the expectations of the owners. There was, we are informed, an entire absence of vibration at all speeds, which will add very greatly to the comfort of the passengers, and should make the Almeda a popular ship.

The vessel and her machinery were constructed under the personal supervision of Goodwin-Hamilton and Adamson, Ltd., of Liverpool, the appointed naval architects to the Blue Star Line (1920), Ltd., and Mr. E. A. Thomson, the senior superintendent of the Blue Star Line. We desire to express our indebtedness to the builders and owners of the Almeda for the facilities afforded us to inspect the ship. The photographs of the public rooms, and particularly of the machinery spaces, deserve mention. They were taken for the builders by Mr. Stewart Bale, of Liverpool.

South African Engineering Notes.

Corundum Industry.

During the present year there has been a great expansion of the corundum mining industry in South Africa. Up to the end of September corundum to the value of £34,392 had been produced. The highest previous amount was reached in 1918, when the value of the production for the year was £26,260. The value of that for each of the months July, August and September exceeded £5000, so that the total for 1926 will most likely reach £50,000. The demand for South African corundum, if it is clean and well graded, is brisk and continuous. The resources of the country are now better known to all the great users, and the quality of the material is right. Prices have advanced recently, and may do so even more if present standards of quality are maintained. As to the extent of the deposits, Dr. A. L. Hall, of the Union Geological Survey, says that the corundum fields occupy a stretch of country some 2000 square miles in extent. From the economic point, the South African fields are considered to be the most extensive and richest in the world. Reef corundum has been proved at many localities, and shows a high content of corundum, which is said to be distinctly superior to that of the Ontario fields. Furthermore, the quality of the material has proved thoroughly satisfactory, as is shown not only from the analysis, but also from technical tests. Most of the material exported consists of more or less broken crystals concentrated from deposits of gravels formed by the weathering of the numerous corundum plumascite occurrences. The amount of corundum available as crystal is limited, but it is possible—as is, in fact, being done to-day by a company near Bandolier Kop—to anticipate the slow weathering action of nature, and to extract the corundum from the reef by suitable mechanical treatment in the form of grain. It is said that the grains so produced are even better than those produced from the alluvial crystals, and that they are every bit as good as those formerly produced from the nepheline syenite rock in Canada. A new company with a capital of £75,000 has just been formed to acquire the property, claims rights, reduction plant, machinery, &c. of the company near Bandolier Kop in the Northern Transvaal. It will produce refined concentrates ready for immediate use for any purpose required. A specially designed grading plant, which is considered to be the foremost in the world for the purpose, is installed on the property, but a larger plant, embodying improvements on experience gained by treating various types of Transvaal corundum, has now been completed, and further grading machinery imported to increase the range of grades to comply with all trade demands. The capacity of the reduction plant will be increased to 300 tons monthly now, and further additions will be made as required.

S.A.R. Contracts.

The South African Railways Administration is now in the market inviting tenders for fifty-two heavy locomotives. The British manufacturers will probably be doubly handicapped on this occasion, as, in addition to the fact that their tenders are almost invariably higher than those of their competitors, they will find it difficult to give a guarantee of delivery within a certain period, owing to the continuance of the British coal strike.

This inability to guarantee delivery to time was a factor with regard to the placing of the £250,000 order for rails with Germany. All quotations on behalf of British firms stipulated, so it is said, delivery within a specified period "after the cessation of the coal strike," which, of course, was unacceptable. The Railways Tender Board is also stated to have been influenced by the fact that the Continental Combine was about to become an accomplished fact, and that prices might afterwards be put up. Also it was thought that the Administration may possibly be placed in the preferential classification of "old customers," which the British and continental firms are thought likely to observe. Whatever action regarding prices the European Railmakers' Association may take, it is felt that there is a strong probability that when business representing anything up to £1,000,000 is being offered, the fact of the former connection with a firm is likely to prove useful.

In Place of British Coal.

The prolonged coal strike in Britain was responsible for very large shipments of coal abroad from the Union. A cargo of 9000 tons of coal was shipped to the Argentine, which is probably the first time South African coal has been sent to South America—at all events in any quantity. More is to follow. Some 50,000 tons had been shipped to Britain up to the end of October; more was sent during November. Quantities are also going to the East and various coaling depots, all in place of British coal which cannot be obtained. The exact quantity of coal shipped to take the place of British coal cannot be stated, but during July, August and September 853,813 tons of coal were shipped at Union ports, as compared with 663,386 tons for the corresponding months of 1925, and in all probability the extra quantity for the three months represented the amount by which the Union of South Africa benefited by the British coal strike.

Platinum Extraction.

The pains which German firms, whether metallurgical or chemical or what not, take to study the requirements of South Africa, no matter what they are, and to supply them, are, I regret to say, in marked contrast with the attitude of similar British firms. As soon as the development of the platinum industry had progressed so far that the adoption of extraction plants had to be considered, it was realised from the results obtained by pilot plants that the different ores, norite, dunite, &c., oxidised or sulphide, would require different methods of reduction. The problem was first put before British firms with most unsatisfactory results. Then a director of the Platinum Proprietary Company of Lydenburg, Ltd., interested Herr P. Trotzig, of Freiberg, who so far developed a system for extraction that it was possible to induce Krupp-Grusonwerk to take an interest in the project and to permit the work to be done in their factories and laboratories. The result is that the Krupp firm now offers a plant with a guarantee of an extraction of 85 per cent., and as a matter of fact experimental runs have shown up to 92 per cent. The *S.A. Mining and Engineering Journal* recently gave a *résumé* of the stages by which the final result was arrived at. It is sufficient to quote from it that, dealing with norite ore, the concentrate is produced by the flotation process in an ordinary mechanically-agitated cell of the minerals separation type, and contains about 4 per cent. copper and 5½ per cent. nickel, a high percentage of iron and sulphur, and a certain proportion of lime, magnesia, alumina and silica. Other interesting constituents are silver, running rather more than the platinoids as to ounces per ton, and gold in irregular amounts, from 4 dwt. up to 7 dwt. or 8 dwt. per ton of concentrates. These latter metals are not common in all norite ores, but are regularly present in ore treated, which was from the St. Edmonds farm in the Lydenburg district of the Transvaal. The resultant concentrate is dealt with by a smelting process, which results in a matte containing 12 oz. to 15 oz. of platinoids to the ton, from 15 to 18 per cent. of copper and 22 to 28 per cent. of nickel, with the silver increased to from 18 oz. to 24 oz. and the gold to about 1 oz. This matte is regarded as a product suitable for shipment and sale as a mine product, to be refined in Europe. Estimates suggest that the smelting cost of producing the first matte will not exceed 1s. per ton of ore treated. Thus there has been developed, by painstaking research, a process which suggests a pay limit for ores of the St. Edmonds type, and possibly for the norite and pyroxenite ores generally, of 3 dwt. per ton, with platinum at not less than £10 per ounce. It is stated that it is highly probable that the platinoids, gold and silver will be obtained free of cost to the producer of the matte, for the consideration of the copper and nickel contents of the matte, though it is not impossible that even better terms may be obtainable. The process thus developed belongs in primis to the firm of Krupp. It is now possible for the Platinum Proprietary Company to lay down a plant on proved lines, under a guarantee of performance, and that company's next step will be to do so at an early stage. The capital invested in platinum undertakings in South Africa is over 5 millions, during the next few years millions will be spent on plants, and the German firm, thanks to the pains taken, will get the business.

Record Mineral Output.

In September the mines and diggings of the Union of South Africa produced minerals of the total value of £5,194,959, which constituted a record. October's output beat the previous best—that for July last—by £185,000, while it was £200,000 greater than the total for August. The principal feature of the figures for September was another large increase in the diamond output, the value of which reached £1,168,387, as compared with £911,093 for August, an improvement of £257,294. The value of the mineral output for the nine months ended September 30th was £43,029,181, or £2,385,251 greater than the total for the corresponding period of 1925. The amount would be appreciably increased if the value of the platinum produced to the end of September were included, but owing to the fact that, after concentration, the concentrates have to be sent to London to be refined, only about 2401 oz. had been actually sold up to September 30th, and the amount realised, after allowing for all charges subsequent to the dispatch of the crude platinum from the mine, was £45,612, an average of £19 per oz. Crude platinum in transit at September 30th last was estimated to contain 2221 oz. of platinum and allied metals, so that the total value of the whole production would be close to £90,000. This platinum is all from the mine of the Onverwacht Platinum Company, but crude platinum from the mines of the Transvaal Platinums, Ltd., and the Lydenburg Platinum Areas was also on the way.

THE INSTITUTION OF HEATING AND VENTILATING ENGINEERS.

PRIZE COMPETITION.

THE Council of the Institution of Heating and Ventilating Engineers is enabled to offer during 1927 the following prizes for original papers on subjects connected with heating and ventilating:—The British Commercial Gas Association premium, £10 10s.; the Sirocco First Premium, £6 6s., Second Premium, £4 4s.; the London Premium, £5 5s. The winning of an award may carry with it a medal of the Institution. The prizes will be awarded as follows:—The British Commercial Gas Association Premium will be given for the best paper on "The Use of Gas in connection with Heating and Ventilating"; The Sirocco Premiums for the best papers submitted dealing with ventilation and the general application of fans, air washing, air conditioning, dust and fume removal, mechanical draught, &c.; and the London Premium for the best paper submitted dealing with or any subject connected with heating or hot water supplies. The conditions for the competition are as follows:—Papers submitted must be the sole composition of the competitior, the qualification being that such competitor is either a student attending a technical institute or an assistant actively connected with the business or profession of heating and vehtilating in Great Britain and Ireland, and is not a principal or an employer.

Further particulars may be obtained on application to the secretary of the Institution, 38, Victoria-street, S.W. 1.

THE new beet sugar factory which is being constructed near Wellington, Shropshire, is, it is reported, to be finished by the end of next July, so as to be able to deal with the next crop of roots.

Railway Matters.

FROM to-morrow, January 1st, the Flushing boats will be transferred from Folkestone to Harwich. The boat train leaves Liverpool-street at 10 a.m.

As mentioned in this column last week, Mr. W. T. D. Grundy has succeeded Mr. E. J. Neachell as general manager of the Liverpool Overhead Railway. The office of engineer, also held by Mr. Neachell, will be filled by the promotion of the assistant engineer, Mr. W. L. Box. Mr. Neachell is being retained as consulting engineer.

IN view of Mr. R. W. Reid, the carriage and wagon superintendent of the London, Midland and Scottish Railway, having been made one of the vice-presidents of the company, the directors have appointed Mr. E. J. H. Lemon, the divisional carriage and wagon superintendent at Newton Heath and Earlestown, to succeed Mr. Reid. Mr. Lemon was for some years the carriage and wagon works manager at Derby.

IT was inevitable that with Crewe only 15 miles away and Derby 36 miles, the locomotive, carriage and wagon works of the former North Staffordshire Railway at Stoke-on-Trent would be closed. The representatives of the railway unions concerned have now been informed that all work will be transferred to Crewe or Derby early in the New Year, and the men, except those entitled to a pension, removed there also.

A COLLISION occurred on the evening of last Monday week at Old Hill, on the Great Western Railway. As we read the newspaper reports it would seem that after a passenger train from Birmingham to Kidderminster had arrived a motor train was allowed to leave a siding and to follow the passenger train into the station in order to convey passengers for Halesowen. Apparently the driver of the latter train did not exercise sufficient care, and his train came into collision with the standing passenger train, with the result that ten passengers were slightly hurt.

IN *The Times* of December 16th appeared a letter from Sir Vansittart Bowater enclosing a copy of a letter he wrote to each of the four chief companies as to first aid on trains, and of the replies from three of them. The letter suggested that each passenger train should carry a first aid outfit, and remarked that if such had been available in a recent serious accident it would possibly have saved life. Whilst the answers gave the assurance that such equipment is already carried, we may remark that one of the results of the Hawes Junction accident of fourteen years ago was the provision on all express trains of first aid equipment, wrecking tools and fire-fighting appliances, and that such provision is gradually being extended to all trains.

DISCUSSING recently, in its finance and commerce columns, the dividend problem of the railways, *The Times* gave the figures for the depreciation funds held by each company, and, in debating whether such would be available to assist in maintaining the dividends, remarked :—"Whether these depreciation funds may be used for other purposes than maintenance seems to be an open question." We would observe, in reply, that those funds mainly are made up of monies paid by the Government during the control period for arrears of maintenance and renewal, *i.e.*, for work that would have been done in maintenance and upkeep had material and labour been available. Only a small proportion of those sums can now be wanted for their original purpose, and as they are the companies' own funds they may do what they like with them.

UP to the end of the year 1920 the receipts of the railways of Trinidad exceeded the expenditure, but for the five subsequent years there has been a deficit. The Government, therefore, appointed a Select Committee to look into the question, and a copy of its report now lies before us. The increase of expenditure over receipts is said to have been due to :—(*a*) Competition by motor and water transit ; (*b*) increased cost of administration, fuel, stores, and labour ; (*c*) increase in passenger mileage and a reduction in local fares in an endeavour to compete with motor omnibuses ; and (*d*) an increase in freight rates which diverted traffic from the railway. Figures given in the report show that the volume of freight traffic was maintained, but that the loss was in the passenger business. The Committee therefore recommended that "drastic and immediate steps be taken to reduce the cost of administration, running expenses and upkeep." That the administration could be reduced is shown by the general manager's department having twelve clerks in 1925 against six in 1920, and the salaries being £3880 a year as compared with £2706, the accountant's department salaries being £3394, as compared with £2068, and the storekeeper's £1650, as against £878.

A CASE which has been mentioned in the last two annual reports of the National Union of Railwaymen was dismissed in the House of Lords on the 14th inst. It arose out of the deaths of a signal ganger and a signal fitter's mate, and hinged on the interpretation of the look-out man's rule under which, in this case, the ganger, if he thought that danger was likely to arise, was to appoint a look-out man. Both men were killed whilst engaged on the work in question and the ganger's widow refused compensation under the Workmen's Compensation Act, preferring to sue for damages for negligence and a breach of statutory duty. The statutory duty alluded to was that, under the Act of 1900, the railway company was in all cases where danger was likely to arise to provide persons or apparatus for the purpose of maintaining a good look-out. The question thus arose : Was the second man an assistant or was he a look-out man ? Mr. Justice Avory, at the original trial, put seven questions to the jury, whose answers showed that it was a "one-man" job, that the mate was the look-out man, and that the ganger was killed by the negligence of one or other or both of them. The Court of Appeal dismissed the appeal of the widow, and now the House of Lords has confirmed the original judgment. As the Lord Chancellor said, if the second man was a look-out man, then one was appointed, and so the company had done no wrong ; if the second man was a mate, then the deceased had failed in his duty under the rule to provide a look-out man.

Notes and Memoranda.

SOME ore crushers recently made by the Allis-Chalmers Company, of Milwaukee, for a Chilian copper mine, are each capable of crushing single pieces weighing as much as 7 tons down to 12in. size. They will take a charge of 70 tons at a time, and have a capacity of from 2000 to 2500 tons per hour. The total weight of each crusher is put at 500 tons, and the largest piece weighs about 60 tons.

IT may be deduced from some figures given in a recent report of the Canadian Department of Mines, that if the whole of the energy represented by the heat in the hot springs of Banff could be recovered, some 16,000 horse-power could be developed. Such a calculation, however, assumes 100 per cent. efficiency and a working range between zero and 100 deg. Fah.—the temperature of the springs.

STEAM and motor navigation has again increased by leaps and bounds on the Yangtze. The number of vessels which have navigated between Ichang and Chungking rose from 43 during 1924 to 58 during 1925, and ten new vessels are expected on the run in the near future. The tendency to building smaller vessels has been maintained, and the majority are of such draught and tonnage that they can ply all the year round.

IN an account of the manganese deposits of the Postmasburg district, given in the *South African Mining and Engineering Journal*, it is said that the ore contains the finest ferro-manganese grade of ore yet discovered anywhere. The metallic manganese contents vary from 42 to 58 per cent., and there is no phosphorus present. Silica varies from 1·75 to 7·0 per cent., and iron from 3·25 to 10·9 per cent. Arrangements are being made to mine it at the rate of 200,000 tons a year.

THE Florianopolis Bridge, Brazil, with a main span of 1113ft. 9in., is, according to a paper read before the Boston Society of Civil Engineers by Mr. D. B. Steinman, the longest span bridge in South America and the longest eye-bar suspension span in the world. It is of especial interest in being the first application of a new form of suspension stiffening construction. It is also of interest in being the first structure in the world to utilise a recently developed structural material—high tension, heat treated steel.

ACCORDING to Professor H. T. Barnes, of McGill University, dynamite was used in breaking up an ice jam, on the Allegheny River, 25 miles long, to prepare channels for the final removal of the pack, while calcium chloride was also employed for this purpose. Sand and gravel were spread on the ice at certain points to gather the sun's heat and rot the ice faster. "It was remarkable," he declared, "to see the rapidity with which the gravel sank into the ice, and at these treated points patches of water opened when the weather moderated."

RECENT experiments in heat treating of steel by C. W. Bryan, chief engineer, and C. G. E. Larsson, assistant chief engineer of the American Bridge Company, have, it is claimed, resulted in the production of a steel having an elastic limit of between 75,000 lb. and 100,000 lb. per square inch. With this high elastic limit it is permissible to increase the unit working stress from 16,000 lb. to 50,000 lb. per square inch, thereby requiring less than one-third as much steel as would be necessary in the use of the ordinary 30,000 lb. per square inch elastic limit steel.

EVERY rig builder should, according to American official advice, know that the maximum span across which a 2in. by 12in. Western pine plank will safely support the weight of a 175 lb. man at the centre when he is working on the platform, perhaps lifting lumber for derrick legs, girts or braces, is about 9ft. When Oregon pine lumber is used the distance between supports may be increased to 12ft. These spans are figured on the assumption that the moving load due to a man working and lifting on a platform is equal to twice the weight of a man.

IN forming the north-shore end of the subway under the Oakland Estuary at Oakland, California, an unforeseen problem arose, according to the *Engineering News-Record*, when the heat generated by the chemical action of the concrete in setting softened the asphalt waterproofing under the concrete. On the surface that was thus lubricated a portion of the invert that had just been poured moved slowly downgrade a total of 6in. It was stopped and held by an arrangement of jacks without any harm to the structure and a change in design prevented any further trouble in sections poured later.

THE Graybar Building, which is being erected over the Grand Central Terminal tracks between Forty-third and Forty-fourth streets, Depew-place and Lexington-avenue, New York City, is, according to the *Contract Record*, utilising asbestos in the form of mats to obviate the ibration caused by the trains rolling over the tracks below the building. The mats consist of a pan-shaped sheet of lead, imbedded in concrete, which sits on the rock foundation, a sheet of asbestos ¾in. thick, a layer of 20-gauge sheet iron, another sheet of asbestos, and sheet lead again on the top. The three entirely different materials used are to form this mat because each has a different wave length, and that, it is claimed, will break up the vibration and nullify its effect.

NATURAL graphite is used chiefly in the manufacture of foundry facings, pigments and paints, crucibles, pencils and crayons, and commutator brushes, according to a recently issued American Government report. Contrary to general opinion, the use of graphite in the manufacture of crucibles is comparatively small. Only 15 per cent. of the consumption for finished products went to that use in 1923 and 13 per cent. in 1924. Foundry facings consumed the largest proportion—44 per cent. in 1923 and 52 per cent. in 1924. Pigments and paints were second in the quantity of graphite consumed—16 per cent. in 1923 and 18 per cent. in 1924. The manufacturers of pencils and crayons and of commutator brushes ranked fourth and fifth as consumers of graphite, each taking 9 per cent. in 1923 and 5 per cent. in 1924. These five products used 91 per cent. of the total in 1923 and 93 per cent. of it in 1924. Only three uses, all minor, showed increases in 1924 as compared with 1923. Graphite for bearings and bushings and for lubricants commands the highest prices.

Miscellanea.

A NEW cold storage and ice factory is to be put up in Perth at a cost of about £20,000.

IT is expected that the pioneer headings of the 5-mile Moffat Tunnel, near Denver, U.S.A., will meet some time during next March.

A RUBBER tire factory, with a capacity of 1000 tires a day, is to be put up near Sydney, Australia. It is to be ready for work in about twelve months.

IT is proposed to construct a dam across the Colorado River for irrigation purposes, which would back up the water for 205 miles. The height of the dam would be 693ft.

THE municipality of Burghersdorp, South Africa, has decided to install a steam engine and boiler in its power station, on account of the failure of the existing oil engines.

WORK has been started on the erection of the new bridge which is to connect Durban with Durban North, across the Umgeni River. The bridge, it is said, will be one of the largest in the Union of South Africa, and will have six spans of 200ft. each.

PLANS are under way for re-opening the Canadian Explosives Company's plant at Nobel, 6 miles from Parry Sound, Ontario. During the war the Nobel plant was one of the largest producing explosive plants in Canada, but it has since remained closed.

THE United States Radium Corporation has, according to the *Chemical Trades Journal*, closed its plant at Orange, N.J., where for several years the company had manufactured luminous paints from radium salts and applied the paints to watch and clock dials.

MORE metallic cadmium was produced in the United States in 1925 than in any other year since 1906, according to reports made by producers of cadmium to the Bureau of Mines, Department of Commerce. The production at six plants amounted to 502,824 lb., valued at 276,553 dollars, at the average selling price of 55 cents a pound based on total sales by producers.

THE British Commercial Secretary in Vienna states that in 1925 nineteen water power works were completed, yielding 63,000 mean horse-power yearly and a possible 301 million kilowatts in the year. It was expected that in 1926 the corresponding figures would be only four works, with 7400 horse-power and 62 million kilowatts. Four works, with 43,000 horse-power and 342 million kilowatts, were begun in 1925, and 4000 kiloms. of high-tension electric conduits have been completed since 1917.

THE technical terms employed in the branches of physics and physiology with which the study of illumination is concerned are not widely known. It has therefore been thought desirable to publish some explanatory notes of the more common terms in order that readers of the published reports of the work of the Illumination Research Committee of the Department of Scientific and Industrial Research may not be handicapped by a lack of knowledge of the meaning of the terms used. The paper, price 9d., is published by H.M. Stationery Office.

THE electrical department of Durban has issued a budget for £64,775 on machinery, plant and buildings ; £33,359 on cables ; £28,039 on sub-station buildings and equipment ; and over £30,000 on extensions to overhead mains, street lighting and house services. An allowance of £10,000 is included for expenditure this year on switch-gear, cables, &c., to connect the present system with the Electricity Supply Commission's new power station at Congella, the total estimated cost of this important work being over £58,000. The total capital expenditure of this department is £170,193.

THERE have been negotiations, says the Board of Trade *Journal*, between two of the Austrian banks and American financiers regarding the financing of a very ambitious scheme for exploiting the energy in the Danube near Vienna by means of a 40-kilom.-long canal. It is stated that 130,000 horse-power could be obtained, and that the much-discussed Viennese problems of a new free harbour and protection from floods could be solved at the same time. However, it does not seem certain whether there would be a sale for so much additional current unless the railways near Vienna were electrified.

THE monthly report of the National Federation of Iron and Steel Manufacturers states that two additional blast-furnaces were blown in towards the end of November, bringing the total to seven in operation at the end of the month, compared with 147 on the eve of the coal stoppage. Production of pig iron in November amounted to 12,700 tons, compared with 13,100 tons in October, 539,100 tons in April, and 494,100 tons in November, 1925. The production of steel amounted to 97,500 tons in November, compared with 94,200 tons in October, 661,000 tons in April, and 653,800 tons in November, 1925.

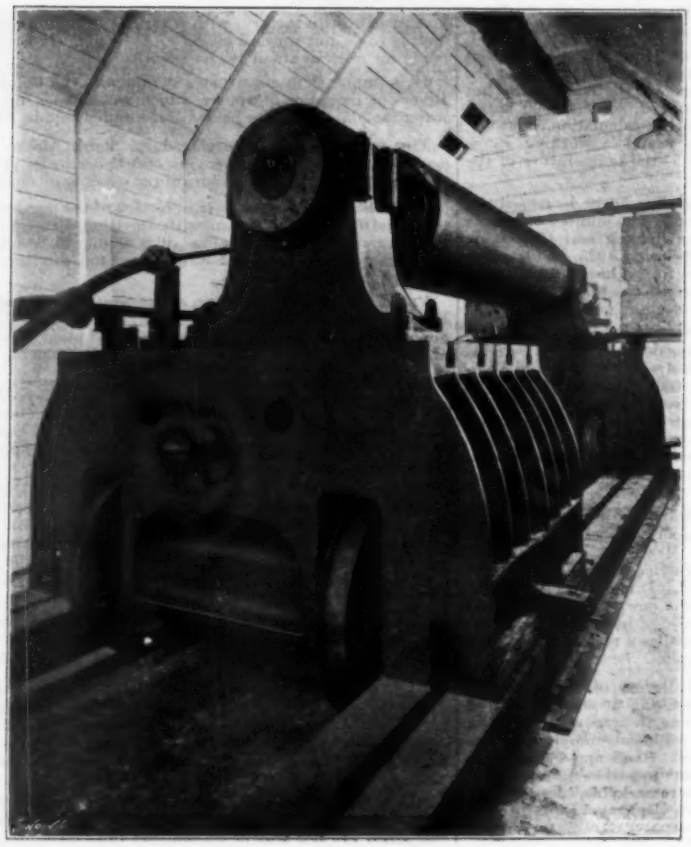
THE Main Reef Leader of the Rand has, according to the *S.A. Mining and Engineering Journal*, been exposed in a cross-cut from No. 4A shaft on the 27th level, the average value of the reef being 14·5 dwt. over an estimated stoping width of 48in., which is equivalent to 696 inch-dwt. The position of the 27th level is approximately 1000ft. on the dip of the reef below the lowest development level—the 23rd—on reef in this section of the mine. It is 85ft. above the point where the reef was intersected in No. 4A shaft in February, 1925, when the value obtained was 8 dwt. over the then estimated stoping width of 54in.

COCHIN is to be provided with a first-class tidal harbour. The first stage of the work, which is now being carried out, is the dredging of the harbour and its approaches to allow vessels drawing 26ft. to moor in the stream. The adjacent area is being reclaimed with the dredgings. The scheme contemplates the provision of wharves or jetties, with complete modern equipment and the extension of railways to serve the port. Similar developments are being carried out at Tuticorin. It is proposed to form a turning basin for vessels drawing up to 26ft., and, later, to construct wharves or jetties with mechanical equipments and railway service. At present dredging and rock breaking is being carried out, and a narrow land-locked canal, with a turning basin of 1000ft. square, is being made.

AN OVERSPEED TEST HOUSE

THE METROPOLITAN-VICKERS ELECTRICAL COMPANY, LTD., MANCHESTER ENGINEERS

(*For description see page 722*)



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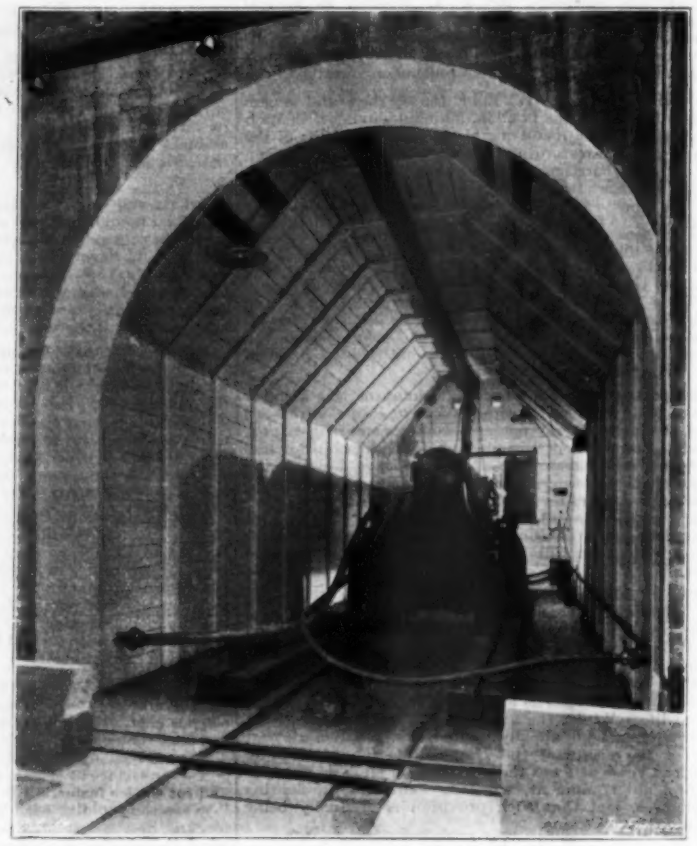
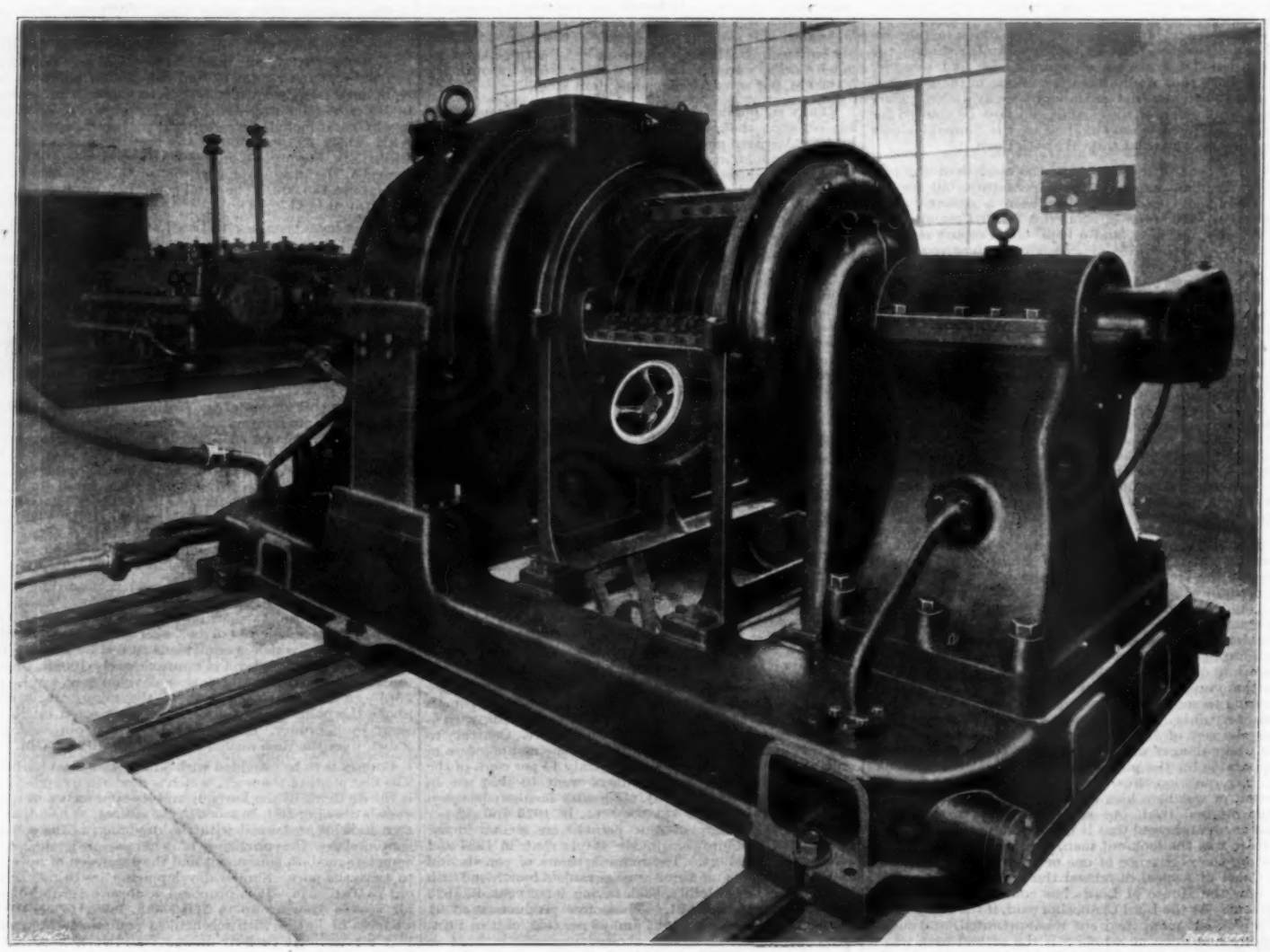


INTERIOR VIEW OF HOUSE



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SIXTEEN-PAGE SUPPLEMENT, "THE METALLURGIST."

The Metallurgist

THE DECEMBER NUMBER OF THE MONTHLY METALLURGICAL SUPPLEMENT TO "THE ENGINEER" ACCOMPANIES THIS ISSUE.

THE ENGINEER.

DECEMBER 31, 1926.

Government and Industry.

IT is not so very many years since the Government of this country conducted its business with an almost complete detachment from affairs connected with the prosperity of trade or the safety and welfare of the populace. The rivers flowing through our great towns and cities might become noisome, open sewers poisoning the inhabitants and workers along their banks, but the Government left matters of public sanitation in the hands of the vestries and similar bodies practically without check on how they did their work or spent the money they were empowered to collect. The metropolitan water supply might be drawn from cholera-contaminated wells; the companies entrusted with giving London its water could conduct their operations secure in the knowledge that no inquiries would be made from official quarters, except at long intervals, and then only as to the rates they were charging, the number of requisitions for continuous supply which they had received and similar questions of administrative interest. On the railways the adoption of precautions against accidents was left entirely to the companies; Parliament refused to assume any power in the matter because it feared to diminish the companies' responsibility. Reservoirs might fail, as did that at Sheffield in 1864, causing the loss of 238 lives, but Bills designed to give the Government some kind of control over the design and construction of such works were received with scant sympathy. Tragic disasters at sea caused, as in the cases of the steamers London and Amalia, by flimsy construction in a vital part, were productive of nothing more than a revision in the qualifications expected in Board of Trade surveyors. Even after such revision it was still possible, as revealed when a fatal boiler explosion occurred on the steamer Talbot in 1866, for a boiler manufacturer in his dual capacity of Government surveyor to issue to himself and his customer an official certificate of the worthiness of his own work. In 1864 three or four miners were being killed every day in British mines; Parliament held its duty done by authorising the appointment of twelve inspectors to cover the whole country. These and many other facts that might be quoted serve, in contrast with modern conditions, to show that within the past sixty years a great—indeed, a revolutionary—change has occurred. To-day, the bulk of Government work is concerned with matters affecting industrial prosperity and the safety, health and comfort of the public. No one questions the value of the all-round improvement in the conditions under which we now live and work. But in so far as these improved conditions have been wrought by Government action we have lost something of the sturdy, beneficial independence that marked commerce and industry in mid-Victorian times. Is there no danger to be feared in the unlimited development of Government control and assistance? Should we wholly rejoice that Government activity in these matters is to-day as studiously great as it was studiously sluggish in our fathers' and grandfathers' time?

The influence of the Government on our industrial and communal life has now reached a high stage of development. Sixty years ago, when a locomotive boiler exploded there would follow a more or less perfunctory inquiry into the cause on the part of the Board of Trade. Other types of boiler might, however, explode, as they repeatedly did, with disastrous results, without incurring any official investigation other than a coroner's inquest, which in the absence of expert witnesses or assessors was usually itself a farce. At least one boiler insurance company was formed with the avowed object of creating an organisation that would render superfluous the appointment of troublesome officials charged with the duty of investigating explosions. To-day, the Boiler Explosions Acts are applied impartially to mishaps to all forms of vessels or apparatus containing steam under pressure. Not only boilers for the generation of steam, but bakers' ovens, pipes, stop valves, steam heaters and many other types of appliance or fitting are investigated officially, when they meet with an accident resulting from the pressure contained in them. We accept this activity on the part of the Board of Trade with complete equanimity, and indeed welcome the surveyors' reports as valuable documents generally containing sound instruction for our future guidance. In the 'sixties the Government factory inspectors were few in number, and their authority covered only a few selected industries. To-day, the Factory Acts extend uniformly over all the country. Turn where we will, it is hard to find a single industrial operation, from the handling of type in a printing establishment to the lifting of bales of cloth in a woollen factory, from the grinding of cutlery to the cutting of timber, which is not affected directly or indirectly by some official order or regulation. Nor does the Government wait as it used to do until public opinion has been roused almost to the verge of revolt before it sets about its work. Murders, outrages and terrifying journeys in blazing compartments were required before the Government of a former time was at length driven to compel the railway companies to provide means of communication with the guard and driver on all passenger trains. In 1865 the occurrence within a week of two lamentable railway disasters elicited an expression of pleasure in these columns on the ground that they would probably result in attention being given at last to the compulsory observance of obvious safety requirements. To-day the Government would be blamed if it did not recognise the necessity for action at the first hint of danger, and even, in some instances, if it did not anticipate dangerous conditions and eliminate the possibility of their arising by the issue of appropriate orders and rules. Contrast the official attitude towards the introduction of railways with that observed by the Government towards the introduction of civil aviation. In 1825 and the years following the land question was the chief and practically the only aspect of railway construction with which the Government of the day considered it had anything to do. In 1919 civil aviation was not allowed to begin until official regulations had been framed covering every foreseeable safety precaution from the compulsory periodic inspection of the engine and medical examination of the pilot down to the form of log book to be used and the identification marks to be borne by the machine.

It is not, however, solely in the enforcement of regulations to prevent misdeeds and mishaps that we may trace the amazing spread of the Government's influence on industry. We find it prominently in the willingness which the Government now manifests to assist industry, both financially and technically. Sixty years ago it was deemed a gracious act on the part of the Admiralty to remeasure and test the Skelmorlie measured mile which Messrs. Napier had established on the Clyde

at their own expense, and graciousness became generosity when payment for the examination was declined. Official technical assistance to industry may be said to have begun with the establishment of the Imperial Institute in 1887, although judged by results it might be argued that no serious beginning was made until 1901, in which year the National Physical Laboratory was created on a small scale. To-day the Laboratory is but an item in the immense Government organisation designed to promote and assist industrial development. Very rapidly that organisation is becoming universally recognised, not only as a principal source of new technical information, but as the highest testing authority in the country. We expect the Government not only to institute and maintain the fundamental and derived units of measurement, but to undertake the principal share of general research work in an ever-widening sphere of subjects, from the fatigue of metals to the fatigue of workers, from vocational psychology to the preservation of apples. Nothing perhaps is more symptomatic of the change in the attitude of the Government towards industry than the alteration that has occurred in the status of the Government contractor and in the respect accorded goods supplied under a Government contract. In the old days the Government contractor was, according, at any rate, to a widely held popular belief, nine parts a rogue who fattened on the short commons of the services. His goods were a by-word for shoddiness and inefficiency. But to-day there is no prouder inscription on a firm's notepaper than the announcement that it is on the Admiralty, War Office and India Office lists, while the statement that the goods it sells to the public are "as supplied to the Government" is advanced and is accepted as the highest possible recommendation of their quality.

Sixty years ago the Government's activity in regulating and assisting industry, meagre though that activity now seems to us, was regarded by those affected by it as being in large part an unwarranted interference with traditional liberty, and was accepted frequently with anything but willingness and pleasure. To-day with the activity intensified a good hundredfold, we take it as being among the natural functions of a Government. Even when the Government takes over an efficiently conducted private investigation and makes itself responsible for its farther conduct, as it did in the case of the Mining Association's coal-dust explosion experiments at Altofts, no feeling of assumption or interference is aroused; on the contrary, the change will be acclaimed as likely to lead to an intensified and less partial research. When the Government seeks to check some growing industrial abuse or disease, it is not accused nowadays of gross interference. Rather would it be arraigned as neglectful of its bounden duty if it failed to take the necessary steps long before public opinion on the subject became vocal. If our coal resources threaten to fail us, it is, according to our modern trend of thought, the Government's duty to deal with the matter. While we are adding daily to the demand made on the mines, let the Government provide against exhaustion by means of its Fuel Research Station, its active participation in the development of oilfields abroad and its search for fresh supplies at home. Of those responsible for placing a thousand new motor vehicles on our roads every week, who stops to consider the inevitable outcome? Who, considering it, comes to any other conclusion than that it is the Ministry of Transport's duty, and its alone, to anticipate and provide for the threatened congestion and deadlock by the creation of new roads and strengthened bridges? The Government to-day has grown to be the greatest leader in industry in the country. We look to it to solve the major portion of our problems, financial, technical and human. It was not so in former times. Then it was wholly dissociated from, almost at enmity with, industry. Like the old country squire, it deemed industrial dealings beneath its dignity, and, like him again, turned its attention to them only when self-preservation compelled it to do so.

We do not desire to witness a return to the earlier state. We realise very forcibly that, humanitarian considerations apart, the industrial life of this country would suffer a severe, possibly a fatal, check were the Government's activity allowed to decay. But looking back we cannot fail to see that in the old days there was a degree of healthy, self-reliance about industry that is to-day largely wanting. Looking forward, we can readily foresee that farther extension of the Government's influence on industry will tend to create a State wholly dependent on its national executive for its industrial initiative. Whether prosperity will be found compatible with such a condition we cannot forecast. Without venturing on prophecy, however, we feel assured in stating that the ultimate and logical goal of such extension must be nationalisation, and that towards that end we are moving more quickly and more inevitably than some hope and others fear.

The Railway Signal Engineer.

THE success of a railway is judged by three results:—(1) The cost of operation; (2) the speed with which the transportation is effected; and (3) the safety with which the work is done. No one would claim that the last is the least important; it would generally be conceded that it was as prime a factor as the other two. For the splendid standing British railways enjoy in the matter of safety in railway travel credit belongs to four officers in particular. There is the chief mechanical engineer, charged with the construction and upkeep of the locomotives and rolling-stock; there is the civil engineer, responsible for the track, bridges and works; there is the operating manager, who controls the signalmen, and sometimes the enginemen; and, finally, there is the signal engineer. His works are the least in evidence, and yet nothing has contributed as much to safe working as the details for which he is responsible—the refined, complicated interlocking, the system of signals, and the block. It may also be conceded that the signal engineer plays no little part in achieving the second factor—speed. The number of block sections governs the number of trains possible on a length of line, and the positions and visibility of the signals influence the speed attainable. But for the safety appliances fitted to facing points, all trains would have to reduce speed over them. The signal engineer, therefore, contributes considerably to the success that comes from the speed with which the transportation is delivered. Despite these important duties, the signal engineer holds a comparatively minor position in the administration of a railway, and, in any consideration of that point, it is essential to know why that is so. To learn it, it is necessary to go back to the beginning of railways, and taking the former Midland Railway as an example, to the time when the movements between sidings, and often between the main line and sidings, were effected by turntables. The Midland had many turntables, and a man had to be appointed to look after them. He was one Paul Prince, a millwright, whose son, by the way, succeeded him and was the signal superintendent until 1895. When it became necessary to make discs and lamps for signals, it was the elder Prince who made them, and necessarily he was in the department of the chief engineer. On practically all the lines the men who were responsible for the signalling were of what we may, without any disrespect, call the inspector class. Though they lacked the training signal engineers receive to-day, they were sound, practical men, who laid the foundation of the fine signalling system of to-day, and all that that means in the way of speed and safety of operation.

We are led to refer to this subject by the fact that the other day a paper on the organisation of the signal department was read at the Institute of Transport by Mr. R. Falshaw Morkill, the signal and telegraph superintendent of the Metropolitan Railway. Particulars were given of the signalling organisations of some dozen or so privately owned and State-owned railways in different parts of the world, and schemes suitable for a departmental and for a divisional administration were put forward. In that connection two proposals were made, as to which we would make a few remarks. The first was that the duties of the signal and of the telegraph departments should be combined under a signal and telegraph engineer; in other words, that the signal engineer should have the block instruments, telegraphs and telephones, the track circuits, electric locks, &c., and, as a consequence, the telegraph and telephone wires, in his charge. The block system was a development of the electric telegraph, and in those early days of railways to which we have just referred, electricity was a mystery, and men, practised in the art, were necessary to look after them. Thus the telegraph department grew up separate and distinct from the signals. Since then the signal engineer has become of necessity an electrician; the use of electricity in signalling has so grown, and telegraphs and signals are now so combined in many ways, that in many cases signal engineers look after the telegraphs, telephones, electric interlocking, &c. Thus, there can be no objection to Mr. Morkill's first proposal—that the signals and telegraphs be in the same department. His second proposition is one to which, to our mind, there are many objections. It is that the signal and telegraph engineer should hold an independent appointment, and be responsible direct to the general manager, instead of, as is almost the universal practice, to the chief engineer. The reason advanced by the author of the paper is that the officer in question has dealings with many departments—with the chief engineer, operating manager, chief mechanical engineer, running superintendent and the electrical engineer—and therefore should be independent of them all. But we submit that signals and telegraphs are essentially "works," and therefore in the province of the chief engineer. Moreover, rarely has the signal engineer to exercise any independent judgment in matters concerning the civil engineer, though he must necessarily do so towards the other departments named above. We think, too, that for the signal engineer's own good, he were better under the chief engineer. It is true that the times have changed, and no longer is the engineer the strongest officer at a railway board meeting. The chairmen and directors have found it convenient to have the greater part of their business put before them by one officer—the general manager. That procedure has much to commend it, but, even yet, if it be the general manager and not the board that has to be dealt with, it must be better for the signal engineer, if he has an excess over his estimate to explain, a vote for some heavy renewals to obtain, or a disputed point to settle with another department, a neighbouring railway company, or the Ministry of Transport, to have the more powerful pleading of a chief engineer, with the breadth of view, far-seeing vision, and wide experience that, to a remarkable degree, are the peculiar possessions of the chief engineers of British railways.

There is one phase in the organisation of a railway signal department to which we would refer; it is one that hardly received sufficient treatment at the hands of Mr. Morkill. That is, the signal engineer's responsibility for the maintenance of the equipment in his charge. When it is remembered that, although the signal engineer is usually responsible for the maintenance, it is being taken from him on one of the chief railways in this country, it will be appreciated that opinion is divided as to what should be done. We do not know why such a change is being made. It does seem that if the signal engineer does not control maintenance, his responsibility for the signalling is divided, and that, in view of the importance of signalling, may be serious. Furthermore, he cannot so readily know where weaknesses develop or improvements are necessary; neither can the person responsible for the maintenance be aware of the intentions of the signal engineer as to changes the latter will effect when a convenient opportunity for carrying out renewals presents itself. The matter can, however, be argued from another standpoint, and had we to justify the maintenance being outside the signal engineer's responsibility we would claim that it were better for him to concentrate his attention on design, new works, possible economies from signalling, co-operation with other departments, and the lay-out of stations, yards and junctions, so as to obtain the best possible results. It has, too, to be remembered that, in a divisional system, many of the duties of the signal engineer necessarily have to be delegated to divisional officers, and if there be no objection to that, the opposition to the transfer of the maintenance is considerably modified.

Direct Conversion of Low-pressure Superheats into Super-pressures.

THE process of directly converting steam superheats, at much over 1000 deg. Fah., into steam superpressures, but attended with only moderate superheats, if any, was first patented here and abroad by Jacob Perkins in the year 1827, after his long period of practical working with it which had abundantly proved its value; and, although the principle was adopted by Sorel in France* and by Wethered† in the United States and in England, but with very low superheats and steam pressures which, nevertheless, in practice, yielded 30 per cent. to 40 per cent. coal economy over the ordinary forms of superheating, all knowledge of the process has been lost till now; nor is the system likely to be revived in this country until, as usual, some student of history on the Con-

* French patent of September, 1844. Proc. Société d'Encouragement pour l'Industrie Nationale, November 22nd, 1848.

† "Superheating," Proc. Inst. Mech. E., 1849.

tinent obtains in Great Britain the exclusive right to exploit this remarkable invention for improving upon our present orthodox system of high-pressure steam generation in direct contact with the water; and the new patentee's prior patent, granted in Berlin, will then, as usual, give our manufacturers that due assurance of its soundness upon which they, like American manufacturers also, insist before consenting to investigate the practical merits of any new device. In this same way some dozen of Perkins' inventions are once again under patent protection here, although not granted in favour of English patentees.

By direct conversion of intense superheats into super-pressures the steam was generated explosively and by an exact imitation of the then numerous boiler explosions which Perkins had studied so closely in view of their very high thermodynamic efficiency. Stated briefly, the steam was super-pressured while entirely away from and out of contact with the boiler water, which latter, therefore, had not to be increased in its temperature by the usual input of thermal units of, let us say, for example, 355 B.Th.U. at 200 lb. abs. P. up to 469 B.Th.U. at 600 lb. abs. P., but only by the difference of the total B.Th.U. actually in the steam itself at these pressures, namely, a total heat of 1198 B.Th.U. at 200 lb. pressure, dry saturated, was raised to 1210 B.Th.U. at 600 lb. P., on a B.Th.U. input of only 12 B.Th.U. for a pressure increase = + 400 lb. (= viz., 33 lb. pressure rise for every B.Th.U. input) in place of the usual inputs into the liquid at these pressures, *i.e.*, 469 − 355 = 114 B.Th.U. input by the orthodox method, and the only method that is known to-day for raising the steam pressure from and in direct contact with the water of the boiler.

The Perkins process involved three stages of generation. Firstly: the feed-water was compressed, under very high pressure, into a boiler maintained constantly full up with water. That abolished the water level gauge completely. Incidentally, he had found, by years of practical working tests, that a film of highly superheated steam was formed directly over the heating surfaces of boilers where they came next to the fire while at extremely high pressures; and this film—"due to the repulsive effect of heat"—is an ineffective conductor of heat, producing low convection with a tendency to facilitate burning of the metal. Although held up to ridicule by the technical Press of that time for his practical demonstrations of a fact which the average intelligence of his period refused to comprehend, patents are now being taken out here to cover this very system of "everfull" water boiler; and the Mark Benson boiler is designed on these Perkins lines, while the "Atmos" boiler is an alternative to it based on the same Perkins experiences, its prototype here being the Burr and Thompson revolving boiler patented in 1825, soon after Perkins' demonstration of the existence of the non-conducting film, and which, in his own time, brought Perkins not honour, but derision. Now, the Atmos Company is able to measure the depth of the "Perkins" film.

Secondly: in the second stage the water, which had to be driven out of the boiler against the pressure of a weighted valve by the force of hydraulic pressure applied without by pump, flashed into steam, but mingled with water, because Perkins could not admit of any large drum in which to facilitate the freeing of the steam from the water. Steam from stage number one was therefore passed through a superheater maintained "cherry-red" at about 1200 deg. Fah. and thence delivered into a small drum proved at 20,000 lb. per square inch. This drum commonly became red hot with the heat of the steam within it, yet with only a very moderate steam pressure. Thirdly: the third process in the plant involved the conversion of the high superheats and low pressures into super-pressures, and this was accomplished by spraying hot water into the drum by means of a force pump, when the low-pressure superheated steam instantly became merely dry, or slightly superheated, steam at pressures up to 1 ton per square inch, according to the rate of water injection. When the water injector was slowed down the steam pressures dropped rapidly, because steam, deprived of its moisture, ceases to be the vehicle of power.

As a matter of fact more steam generators of this Perkins system were made in 1826 by Perkins, and capable of working up to 3000 lb. per square inch, than can be proved to be made to-day by any one maker of boilers in the world; but as Perkins was then arduously struggling against the great vested interests of the period as represented by Boulton and Watt's firm, and he had even dared to apply this system to the heating of Boulton-Watt boilers, by means of the high-pressure steam delivered from his own, he encountered the bitterest hostility which, from the first, threatened a financial failure owing to the general prejudice intentionally created throughout the country. In effect, Jacob's moneyed partner very soon failed and the whole of the patents by Jacob were thereupon placed in Chancery. Since that time, to this day, not even a German firm has re-patented this unique process for converting superheats into super-pressures away from and out of contact with the water of the orthodox boiler with its usual large "bank" of latent heat. It was the unfortunate Trevithick (who also incurred the displeasure of Boulton and Watt) who pointed out that the latent heat in his boiler would run his engine, without fire, for half-an-hour; but this boiler reserve figures against the immediate steam production economy. The Perkins boilers carried little latent heat or very small reserves. The following examples illustrate the Perkins' process:—

1210 *B.Th.U. Per Pound Steam, Specific.*

Superheated (486 deg. Fah.) + 250 deg. Fah.		Saturated (486 deg. Fah.) (Dry).
Abs. press. per square inch. 1 lb.	=	Abs. press. per square inch. 600 lb.

For a given heat, dry saturated steam has 600 times the steam pressure of steam which is superheated to over 250 deg. Fah., the temperatures of both steams being 486 deg. Fah. On the other hand, the volume of this superheated steam (485 cubic feet) has been augmented by 45 per cent. by the superheating, but with its pressure remaining constant at 1 lb. absolute—that is, with no practical power to move a steam engine—whereas the conversion of it into saturated steam compresses the steam's volume (as by the Perkins process) to 0·76 cubic foot, which is capable of performing useful work by means of a sixty-fourfold expansion (12·5 per cent. cut-off) in a Perkins compound uniflow engine and by reducing the pressure through cylinders of long range to about 1 lb. absolute at a point where the superheated steam has not yet begun to do work.

This illustration merely emphasises the fact that the large volumes of dilated steam, as brought about by superheating, have not the same specific internal energy nor the practical working values of small initial volumes of saturated steam containing an equal total of B.Th.U. per pound of steam at equal temperatures. Mechanically, high pressures reduce engine sizes and weights and increase the power output per ton of the plant.

Incidentally, Perkins worked at this new system of steam generation after his removal from Newburyport, at first to Boston and then to Philadelphia,‡ and he first termed it the "concentration steam engine." Many years later he perfected this system at No. 41, Water-lane, Fleet-street, E.C. (A.D. 1823–1827).

A second example, from current steam tables, shows the possibilities of this special Perkins system at ordinary pressures, as follows:—

Total B.Th.U. in Steam at 200 lb. Abs. P. per pound of steam.

Superheated + 200 deg. Fah.		Dry saturated.
1307 B.Th.U.		1198 B.Th.U.
Difference		109
		1307

The difference in B.Th.U. between 200 lb. P. dry saturated, and that of 600 lb. P. dry saturated is 12 B.Th.U. On 9 lb. of steam the difference is 9 × 12 = 108 B.Th.U., corresponding, therefore, to the 109 B.Th.U. input into 1 lb. superheat steam at 200 lb. P. by + 200 deg. Fah. The total volume of 9 lb. dry saturated steam at 600 lb. P. is 9 × 0·76 cubic feet = 6·84 cubic feet; and this, when expanded down to 200 lb. P. (dry) has a specific volume of 9 × 2·29 = 20·6 cubic feet, which is over six times the volume (3·04 cubic feet) of 1 lb. steam superheated by + 200 deg. Fah. at 200 lb. P. abs. containing 1307 B.Th.U., as above.

Where temperatures are limited by the metal used or there is erosion of the turbine blading by high superheats plus high velocities, the maximum temperature allowable favours saturated steam if generated by the unique process invented and practised by Jacob Perkins one hundred years ago.

C.R.K.

‡ *Boston Courier*, 1849.

Literature.

The Gasoline Automobile: Its Design and Construction. Vol. I. By P. M. HELDT. London: Iliffe and Sons. 40s. net.

THIS is the seventh edition of the first of a set of four volumes dealing with different sections of the petrol car—the remaining three being devoted to transmission and control; electrical equipment; and fuels and carburetters. From the author's preface we learn that the chapters dealing with the theoretical phases of the subject are not greatly altered since the first edition was written in 1911, but the chapters have been extended to deal with the newer forms of engine, such, for instance, as the eight-cylinder engines of the vertical and the V types. The chapters dealing with the principal parts and engine tests have been entirely re-written. Three hundred of the illustrations in the text are new, as also are the large scale plates at the end of the book, with one exception, and a chapter has been added on the Diesel type engine, which is still only in its infancy as applied to automotive purposes.

The chapter on pistons, piston rings and piston pins will be read with benefit by all who are engaged in this branch of engineering work, and the information relating to the employment of magnesium will be specially welcome to British engineers. Magnesium as a suitable metal for internal combustion engine pistons is referred to at some length. With a specific gravity of 1·8, or about two-thirds that of aluminium, magnesium alloyed with the latter gives excellent results. The author quotes from the year-book of the German Automobile Manufacturers' Association for 1925 to show that magnesium pistons have proved themselves quite satisfactory as regards wearing qualities. He says that a motor omnibus fitted with pistons made of magnesium had covered 25,000 miles without trouble of any kind and without undue wear of the piston and cylinder walls. The engine of this 'bus had run 18-20 hours per day without shutting down, and the 'bus had covered 125 miles and had been stopped and accelerated some 900 times each day. Over 100,000 magnesium alloy pistons had been made by a German firm up to the end of 1924. As regards machining qualities, this alloy is said to be equally satisfactory. Cutting speeds of 2000ft. per minute are claimed to be possible without showing signs of tearing, and it takes a good sharp thread. The coefficient of heat expansion for pure cast magnesium is given as 0·0000142, while for cast aluminium alloyed with 8 per cent. copper the corresponding figure is 0·0000128 and for grey cast iron 0·00000558. When chill cast magnesium alloy improves with respect to both tensile and elongation, and the shrinkage allowance for patterns is the same as for cast iron. Its tensile strength is between 36,000 lb. and 40,000 lb. per square inch. Those who are interested in this subject should see articles which appeared in THE METALLURGIST—monthly Supplement to THE ENGINEER—on January 29th and February 26th, 1926.

The chapter on the design, construction and machining of crank shafts is very comprehensive, and gives a particularly good insight into the latest American practices. Although the major portion of this book is devoted to American work, British and continental engines with special features have not been entirely neglected by the author, and the chapter on sleeve-valve engines will be found both instructive and up to date. Supercharging is also dealt with at some length. The book is well illustrated, and has a copious index to the contents.

BOOKS RECEIVED.

Pompe Centrifughe. By Ing. M. Medici. Milan: Ulrico Hoepli. Price 35 lire.

"*Mechanical World*" *Year Book*, 1927. London: Emmott and Co., Ltd., 20, Bedford-street, W.C. 2. Price 1s. 6d. net.

The People's Year Book, 1927. Manchester: The Co-operative Wholesale Society, Ltd., 1, Balloon-street. Price 3s. net.

Agricultural Research in 1925. London: Royal Agricultural Society of England, 16, Bedford-square, W.C. 1. Price 2s. 6d. net.

The Marketing Problem. By E. T. Elbourne. London: Longmans, Green and Co., Ltd., 39, Paternoster-row, E.C. 4. Price 10s. net.

Ice and Cold Storage Trades' Directory and Handbook, 1927. London: Iliffe and Sons, Ltd., Dorset House, Tudor-street, E.C. 4. Price 11s. net.

SIXTY YEARS AGO.

FOLLOWING the conclusion of the American Civil War, the year 1866 had opened with many bright prospects for the trade and industry of this country. Everywhere business was good, and in many cases the orders offered were more than could be accepted. It seemed as if the new year would witness an almost unexampled condition of prosperity. The high hopes entertained for it speedily evaporated. The world was uneasy. All Europe was feverishly arming and re-arming its fleets and armies. War broke out between Prussia and Austria, and although the campaign was soon over, its conclusion did nothing to relieve the tension. Rather did it increase it, for the Prussian needle guns showed their hidden power and set all other nations hastily copying them. The unquiet state of international affairs naturally had its reflection in the conditions of trade. In this country a financial crisis developed. Banks all over the country were forced to close their doors and many an industrial firm was forced into bankruptcy. With the development of this situation of unexampled commercial embarrassment an almost total absence of confidence was expressed in projects of an engineering nature. Reviewing the events of the preceding twelve months, in our issue of December 28th, 1866, we had to describe it as "the death year of a host of enterprises." The year had opened with many promising schemes intended for immediate execution. It ended with but a few, and of these few most were spoken of as possibilities of the uncertain future rather than as works to be undertaken as soon as parliamentary sanction for them had been received. The laying of the Atlantic cable and the recovery and completion of the cable lost in 1865 and the finishing of a few great bridges—great as then regarded—such as the Runcorn Bridge and the bridges across the Thames at Cannon-street and Victoria, were the chief items of importance which we could point to as having been accomplished. Work had been begun on the proposed Forth Bridge, but had been abandoned after an experimental caisson had been sunk, and in practically all directions a similar tale had to be told. In one direction, however, progress had been made. It was fitting with the times that in armaments we should have considerable advance to report. We had never been easy critics of the Government in its dealings with technical questions; but, reviewing the developments of 1866 in the production of guns, armour plates, ships and projectiles, we had to admit that the advances made were most important and without parallel in our previous history. Our guns especially had improved. Our 7in. and 9in. guns, firing hard-pointed projectiles, had pierced every target against which they had been brought to bear, and we anticipated that the 9in. weapon, if it were called upon to do so, could at short range and with a full charge pierce without difficulty the 12in. and 15in. laminated armour, in which the Americans placed their trust.

The First Voyage of the Motor Ship Tampa.

THE first voyage of any ship can never be without interest, and when the vessel embodies some notable departure in engineering practice the results of her performance on her maiden trip are always anxiously awaited.

In the case of the motor ship Tampa, owned by the United States Shipping Board, the special point of interest lay in the behaviour of her propelling machinery, as this consisted of one of the new double-acting, two-stroke Diesel oil engines designed by the Worthington Pump and Machinery Corporation of New York, and constructed at their works at Buffalo.

As we illustrated and described this new engine fully in our issue of October 3rd, 1924, and gave the results of its shop trials in our issue of April 23rd, 1926, there is no need to repeat the details now. It will be remembered that the design, although double-acting, was marked by great simplicity and, as far as could be foretold, the engine appeared fully capable of meeting the conditions of continuous full power service at sea.

The anticipations of the designers have been thoroughly fulfilled. The vessel left Savannah with a cargo of cotton on November 22nd, ran her 12-hour official test the next day, and dropped anchor in Bremenhaven Harbour on December 7th—the total time of passage being 14 days 11 hours 31 minutes. The voyage was faster by thirty-six hours than expected, and was completed without the slightest hitch or untoward incident of any kind, the engine behaving perfectly throughout.

By the courtesy of the authorities we were enabled to visit the vessel on her arrival at Bremenhaven and make an inspection of all the machinery. The chief engineer, Mr. L. H. Hirschy, with that good-natured readiness to impart information which is characteristic of American engineers generally, not only gave us every opportunity to assure ourselves as to the details of the performance of the machinery, but has allowed us to publish the engine-room official log of the voyage for the interest and benefit of engineers generally. We have also to thank him for the particulars of the 12-hour official loaded run of the vessel and for the pair of indicator cards which we reproduce below in Figs. 1 and 2.

Rarely, if ever, has such full information of the behaviour of any engines in actual service been made public so quickly after a maiden voyage, and Mr. Hirschy and the authorities of the United States Shipping Board deserve the gratitude of all engineers for the liberal-mindedness of their attitude.

To enable the performance of the engine to be appreciated, it will be well to give a few particulars of the vessel. The Tampa is a single-screw ship built by the Daniels Corporation, of Tampa, Florida, and it was originally fitted with steam machinery. The vessel has been entirely reconditioned during her conversion to Diesel power at the yard of the Newport News Shipbuilding and Dry Dock Company, which firm removed the steam machinery, replacing the same by the Worthington two-stroke, double-acting Diesel oil engine referred to above.

The engine is of the four-cylinder, double-acting, two-stroke type, designed to develop 2950 shaft horse-power

ENGINEER'S PASSAGE REPORT FOR DEISEL ENGINES.

From Savannah, Ga., date November 22nd, 1926, to Bremen, Germany, date, December 7th, 1926

	Port.	Hour.	Date.	Running time.	Port to port. D.	H.	M.	Between pilot stations. D.	H.	M.
Left berth	Savannah, Ga.	12.30 p.m.	11/22/26	At full speed	14	21	28	14	11	24
Left port	Savannah, Ga.	12.30 p.m.	11/22/26	At half speed	—			—		
Left pilot station	Savannah, Ga.	4.53 p.m.	11/22/26	At slow speed	—			—		
Arrived pilot station	Bremen, Germany	9.30 a.m.	12/7/26	Stopped, December 6th, on mistaken hail from Antwerp pilot	—					7
Arrived port anchorage	10.45 p.m., Bremen, Germany	3.19 p.m.	12/7/26	Total time under way	14	11	24	—		
Arrived berth anchorage	Bremen, Germany	11.45 p.m.	12/7/26	Total time of passage	—			14	11	31

ABSTRACT OF DEISEL ENGINEER'S LOG.

Date.	Pressures. Main engine injection air.	Manœuvring air tanks.	Reserve air bottle No. 1.	Scavenge air.	Main L.P. compressor.	Main I.P. compressor.	Cooling water (fresh).	Cooling water (salt).	Lubricating oil.	Revolutions. Per minute.	Total.	Distance. Engines.	Observation.	Slip (per cent.).	Running time. Hours.	Minutes.	Knots per hour by observation.	Temperatures. Atmosphere.	Engine-room.	Sea.	Common exhaust.	Cooling water inlet.	Cooling water outlet.	Lubricating oil.	H.P. air discharge.	Auxiliary machinery running. Auxiliary engine No. 1.	Auxiliary engine No. 2.	Auxiliary engine No. 3.	Kilowatts.	Donkey boiler.	Switchboard. Av. volts.	Total amps.
Nov 23	890	350	940	—	70 26	240	34	22	12	95·07	109,250	243	223	8	19	7	11·6	58	86	72	530	84	120	94	112	24	—	—	1741	24	235	290
24	880	350	920	1¾in.	70 25	240	35	22	12	95·4	134.520	299	315	-4	23	36	13·4	68	90	74	530	86	122	104	116	6	18	—	1632	4	235	300
25	880	350	920	—	70 25	235	35	23	12	94·9	134,700	300	263	12	23	41	11·1	69	90	72	520	86	124	106	118	20	4	—	1681	—	235	300
26	880	350	920	1¾in.	68 25	235	35	22	12	93·6	132,645	296	278	6	23	35	11·8	67	88	74	520	88	126	106	120	—	24	—	1705	—	235	310
27	880	350	920	—	70 25	235	35	22	12	94·8	134,575	299	258	13	23	40	10·9	72	84	72	520	86	126	106	118	—	24	—	1666	—	235	300
28	880	350	920	1¾in.	70 26	235	35	22	12	91·6	129,950	289	268	7	23	37	11·5	72	84	72	520	84	124	104	118	—	24	—	1620	—	235	290
29	880	350	920	—	75 26	235	35	22	12	90·7	128,640	286	271	5	23	38	11·4	72	86	70	525	84	124	102	118	—	24	—	1628	—	235	290
30	880	350	920	1¾in.	72 25	240	35	22	12	92·4	30,770	290	280	3	23	36	12	68	84	66	525	80	122	100	114	—	24	—	1627	—	235	280
Dec. 1	870	350	910	—	70 25	240	35	23	12	94·1	133,100	295	285	4	23	33	12·1	60	84	60	530	74	122	100	110	—	24	—	1600	—	235	280
2	880	350	920	1¾in.	68 25	230	35	23	12	94·4	133,610	297	283	4	23	36	12	62	78	56	520	70	120	96	106	24	—	—	1607	—	235	275
3	885	350	925	1¾in.	68 24	230	34	23	12	94·9	132,940	298	284	4	23	31	12·1	58	84	54	530	68	122	96	106	24	—	—	1634	6	235	280
4	880	350	920	1¾in.	65 25	230	32	23	12	94·7	133,730	297	268	9	23	32	11·4	61	78	54	530	68	122	96	106	24	—	—	1536	6	235	265
5	890	350	900	—	65 25	230	32	23	12	95·3	134,270	301	276	8	23	30	11·74	54	77	53	535	68	122	96	106	24	—	—	1607	—	235	270
6	890	350	900	1¾in.	65 25	230	32	23	12	95·5	136,350	303	289	4	23	41	12·1	43	80	52	530	66	122	95	106	24	—	—	1636	—	235	290
7	890	350	900	1¾in.	70 26	230	32	23	12	96	124,490	276	266	4	21	30	12·4	46	78	48	530	64	120	94	106	21·5	—	—	1498	—	235	290
																													1	—	235	290

REMARKS.

Left dock, Savannah, Ga., November 22nd, 12.30 p.m. Counter 42892. Swung ship 1 hour in harbour to adjust compasses. All clear pilot station 4.53 p.m. Counter, 58130.

November 23rd.—Ran off official 12-hour loaded full-speed trial run, 4 a.m. to 4 p.m. Average revolutions per minute 95. Speed of ship, 12·23. Fuel consumption, 7 tons.

November 24th.—Slight water leak into crank case and oil leak through piston telescope tubes. Made temporary wipers to stop same. Overhauled third and fourth stage compressor valves in No. 1 auxiliary engine and tested. O.K.

November 25th.—Adjusted all engine lubricator drips, as per manufacturers' instructions. No. 3 top cylinder exhaust pyrometer rod out of order. Wiring O.K.; must be element.

November 26th.—Slight trace of lubricating oil in engine cooling tank.

November 27th.—Decreased fuel to No. 1 top spray valve. Changed all oil for winch gears to 600 W. Tried out rubber wipers to keep water out of oil and oil out of water.

November 28th.—Took off crank case, inspection doors, to look for leaks, &c. All O.K.

November 29th.—Reduced lift on No. 2 cylinder bottom back, spray valve.

November 30th.—Took off cofferdam plates to inspect for leaks from sump, F.W. and fuel tanks. O.K.

December 1st.—Lubricating oil centrifuge spindle broke and bent bowl; straightened out same in lathe and put centrifuge in working order again.

December 2nd.—Increased lift of No. 2 cylinder bottom back spray valve. Made adjustments on Mianus engine and tried out same. Works O.K. on governor now.

December 3rd.—No. 4 top cylinder electric pyrometer rod out of order. Getting considerable amount of water out of lubricating oil through centrifuging.

December 4th.—Increased amount of fuel to No. 2 bottom cylinder spray valves. Nos. 1 and 4 piston packing blowing slightly at short intervals, but stops when lubricating oil supply is increased slightly.

December 5th.—Stern gland packing leaking badly. Took up on same several times until there is no more to take up, and will have to add more packing in gland after making port and unloading. Increased lift on No. 2 bottom back spray valve.

December 6th.—Tried out scavenge valve clutch and air starting pilot valves. O.K.

December 7th.—Tried out main engine for reversing, &c., and all auxiliary engines, before making port. All O.K. Arrived lightship 9.30 a.m. Counter, 2022715. Proceeded into port of Bremen. Picked up visiting party, 1.17 p.m., consisting of Mr. Sheedy, U.S.S.B., Mr. Pulman, and Mr. Coleman, of Worthington, and twelve guests. Arrived port and anchored, 3.19 p.m., to await favourable tide to dock.

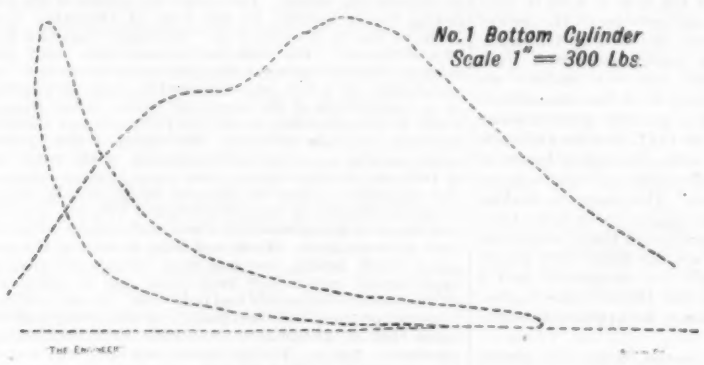


FIG. 1

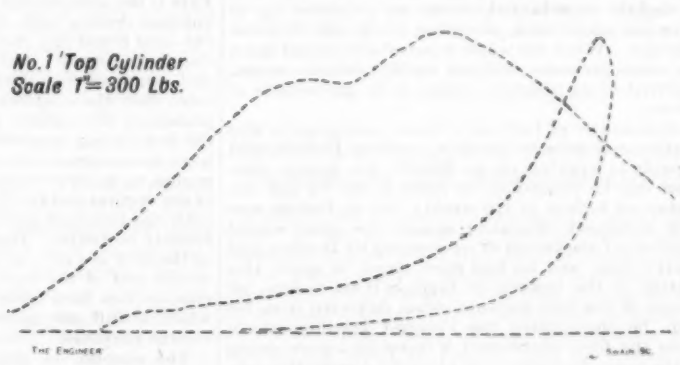


FIG. 2

DOUBLE-ACTING TWO-CYCLE ENGINE ON THE MOTOR SHIP TAMPA

THE WORTHINGTON PUMP AND MACHINERY CORPORATION, BUFFALO, N.Y., ENGINEERS

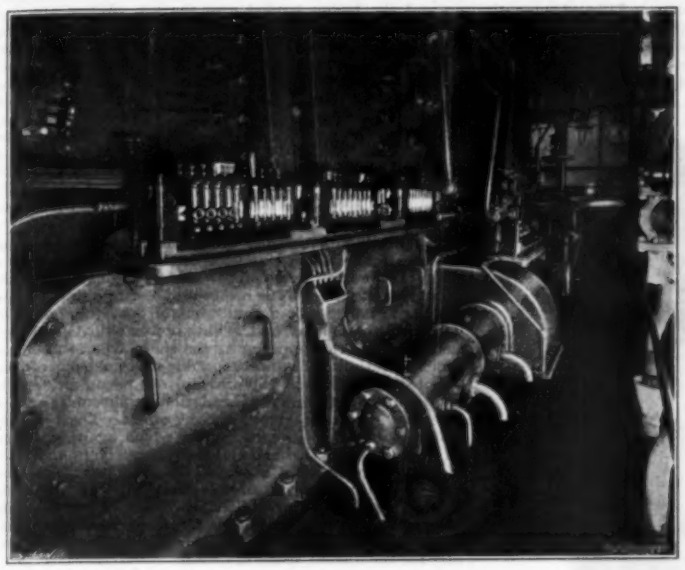


FIG. 3—ENGINE CONTROLS AT FLOOR LEVEL

FIG. 4—VIEW ON TOP PLATFORM

at 95 revolutions per minute. The power cylinders are of forged steel of Worthington design, 28in. in diameter by 40in. stroke, and air injection is used. The dimensions of the Tampa are as follows :—

Overall length	416ft.
Length between perpendiculars	402ft.
Breadth moulded	54ft.
Depth, moulded to main deck	33ft. 9in.
Mean displacement, loaded draught	13,010 tons
Estimated gross tonnage	5959 tons
Net tonnage	3703 tons
Normal mean load draught	26ft. 10¾in.
Deadweight capacity on above draught	9129 tons

The engine-room performance is given fully in the log sheet reproduced on the opposite page, particulars taken from which are continued below :—

Draught and Weights.

	Forward.	Aft.	Mean.	Displacement.	Salt water ballast.	Fresh water.
	ft. in.	ft. in.	ft. in.	Tons.		
Leaving	21 2	22 3	21 8½	10,250	65	150
Arriving	18 6	23 3	20 10½	9,800	65	50
		Average	21 3½	10,025	65	100

Engine Results.

	Between pilot stations.
Total revolutions	1,964,585
Average revolutions per minute	94·2
Distance by engines	4361
Distance by observations	4101
Slip per cent. by observations	6
Average knots per hour by observations	11·82
Total oil consumed at sea, 1510 barrels	1425 by main engine
Average I.H.P. between pilot stations	3980
Average M.I.P., top cylinders	93·1
Average M.I.P., bottom cylinders	84·8
Oil per I.H.P. between pilot stations	·306 lb. per hour
Oil per 100 knots between pilot stations	35·6 barrels

Fuel Oil Consumed.

	Hrs. min.	Barrels.
At sea—		
From dock to pilot station (Savannah)	4 23	12
Between pilot stations	347 24	1425
From pilot station to dock (Bremenhaven)	6 30	22
For refrigeration, For dynamos } Electric driven, under generator consumption	370 0	70
For heating and cooking	351 47	15
Total	1079 23	1580
In port (Savannah)—		
For cargo purposes, winch hours	470 0	43
For ship's purposes (light, heat, &c.), dock to pilot station	228 0	17
Grand total		1624

Fuel oil (about 30–32 Baume, good grade) remaining from last passage, 212,100 gallons.

Fuel oil remaining on board, 3428·7 barrels.

Numbers of ammonia flasks from last passage, No. 5260 and No. 6635, from Barrett Company, Solvay, N.Y.

Names of engineers.	Position.
L. H. Hirschy	Chief engineer
W. C. Dowe	First assistant engineer
C. H. Coburne	Second assistant engineer
A. F. Jones	Third assistant engineer
J. W. Christiansen	Fourth assistant engineer
C. J. Ruzika	Electrician

General Remarks on Weather, Causes of Stoppages, Quality of Stores, Oil, &c.—Weather conditions for trip were very good. Engines ran remarkably well at all times and even when ship was pitching slightly, and a steam engine might have had to be throttled down to prevent racing.

Altogether 1624 barrels of oil were used for all purposes from dock to dock, the main engines consuming 1425 barrels between pilot stations, the fuel consumption at sea being 0·306 lb. per I.H.P. hour. The indicated horse-power taken from an average of a dozen sets of cards was 3980. During the 12-hour official loaded trial previously referred to, which was run on November 23rd, the average speed by navigating observation was 12·23 knots over a distance of 146·8 knots. The engine indicated 3990 horse-power, injection air compressor absorbed 206 indicated horse-power and the scavenging pump 176·6 indicated horse-power.

A pair of cards taken respectively from the bottom and top of No. 1 cylinder during the voyage are reproduced in Figs. 1 and 2. On each card is a diagram 90 deg. out of phase to show the effect of the injection of the fuel. The rise in pressure due to the initial air compression, followed by the further rise due to the burning of the fuel, and the subsequent fall as expansion proceeds, are well shown on the out of phase diagrams.

The log sheet and the cards speak so fully for themselves that there is really nothing to add to the information they gave, and it only remains to us to express again to the owners and the engineers of the vessel our indebtedness for enabling us to publish the information for the benefit of our readers.

It will also be of further interest to our readers to know that the Worthington Pump and Machinery Corporation, having the fullest confidence in their Diesel oil engine, invited a very representative party of marine engineers, shipbuilders and others to make a visit to the vessel on her arrival, and this party, accompanied by Mr. C. P. Coleman, chairman of the Board of Directors, Worthington Pump and Machinery Corporation, and Mr. T. C. Pulman, managing director of Worthington-Simpson, Ltd., London, boarded the Tampa at the mouth of the river Weser before her arrival at Bremenhaven, so taking every advantage of the opportunity offered not only to inspect the machinery in operation but also during the manœuvring into port. Such a close inspection being made on the termination of a voyage of 4100 miles establishes, we believe, a record. On boarding the ship the visitors proceeded directly to the engine-room. Everything was found by the party in excellent condition, and the reports received were in every way satisfactory, as is proved by the inspection of the ship's log. In Fig. 3 we show a view of the top platform of the engine, which indicates the simplicity of the valve gear, whilst Fig. 4 is a view of the control station at floor level.

On the day following arrival in port the same party carried out a further inspection of the machinery when the vessel was in dock, the general opinion expressed being that the machinery installation was satisfactory in every way. While in Bremen advantage was taken to examine the engines before starting on the return voyage. A report of Mr. Dempsey, the guarantee engineer on the Tampa, which we have inspected, states that the condition of the pistons and liners as revealed by examination made through the exhaust and scavenge ports was good. All the running gear was in good order, and it was only necessary to take up the top ends of the connecting rods on the compressor and the scavenge pump. It only remains for us to acknowledge our indebtedness to Mr. Joseph E. Sheedy, Director for Europe for the United States Shipping Board, and Mr. C. P. Coleman, chairman of the Worthington Pump and Machinery Corporation, for their ready consent to our publishing the log sheet of the ship which was placed at our disposal by Mr. Hirschy.

Lubricating Oil, Oil Stores and Fresh Water Used.

	Remaining from last passage.	Received.	Total.	Consumed in port.	Consumed at sea.	Total consumed.	Total remaining.
Lubricating oil (general), D.T.E. heavy medium, gallons	2200	252	2552	136	146	282	2270
Cylinder oil, Navy mineral, gallons	1360	252	1612	22	108	130	1482
Compressor oil, D.T.E. heavy X, gallons	350	101	451	6	18	24	427
Piston-rod, 600 W., gallons	300	100	400	0	57	57	343
Kerosene oil, gallons	0	330	330	10	100	110	220
Refrigerator compressor oil, gallons	8	0	8	0	0	0	8
Bunker lamp oil, gallons	—	—	—	—	—	—	—
Fresh water, tons	100	75	175	25	100	125	50
CO_2 or ammonia, pounds	100	0	100	0	0	0	100

MODERNISATION OF VALPARAISO GASWORKS.

THE following particulars regarding the modernisation of the gasworks at Valparaiso, which are based on an article that recently appeared in *El Mercurio*, have been forwarded to the Department of Overseas Trade by the acting commercial secretary at Valparaiso.

By the installation of an automatic machine for extracting and classifying the coke, the gas company has practically completed the work of modernising its system of gas making. The latest machine not only classifies the coke more efficiently, but it also eliminates manual labour from one of the most arduous operations in the manufacture of gas.

The company consumes about 30,000 tons of coal per annum, all of it the production of the national mines, and from the time it is discharged on the company's mole to the time that the coke lies ready for use the fuel is handled by mechanical means.

On discharge on the mole, the coal is conveyed by a wire ropeway to bunkers where it is mixed, and thereafter taken to a breaker that reduces the pieces to a uniform size. An elevator next raises it to a distributor, which places it in a series of bunkers on top of the retort house. By means of doors in the bottoms of these bunkers measured quantities of coal are delivered to a machine, which, in one operation, removes from the retort the incandescent coke and fills it with a fresh charge.

Until lately the work of removing the coke from the retort house to the yard for cooling and classifying was done by manual labour, but thanks to the new plant, all this heavy labour has been eliminated. The plant consists principally of a monorail, supported on towers, which runs round the yard and through the retort house. The incandescent coke is picked up in cages of iron, which take it to an elevated tank, where it is cooled by immersion. From there it passes to a classifier which automatically separates and places in different bins the large pieces and the dust.

The gas as it leaves the retort at a very high temperature is cooled by bringing it into contact with water in high iron towers. The act of cooling causes the separation of a great part of the tar, of the napthaline, and of the ammoniacal liquor. The gas next passes to a purifier, which removes the rest of the tar, then to a washer which removes the remaining ammoniacal liquor, and finally to dry purifiers which eliminate the sulphurous impurities. The purified gas is then measured and passed to the gasometers.

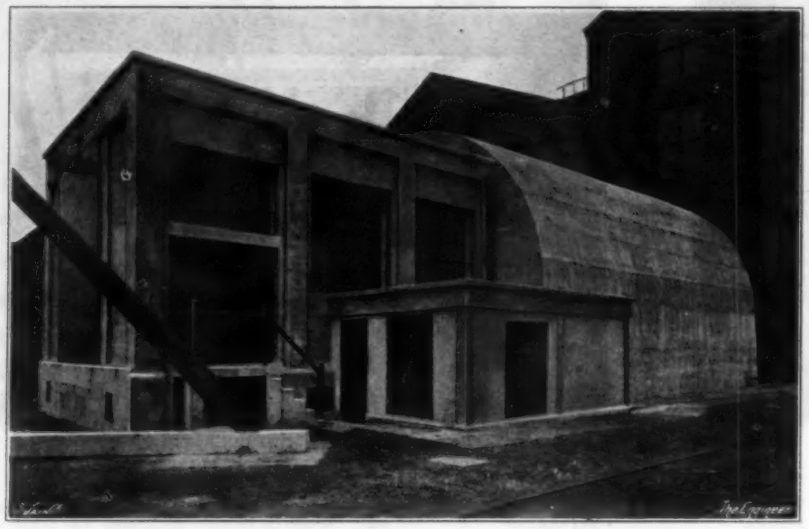
About 1300 tons of tar are produced per annum. This tar is sent to the company's factory in El Recreo, where sundry substances are produced, such as fuel for aeroplanes, asphalt for roads, disinfectants, and paints.

THE statistical section of the annual report for 1925–26 of the Indian Railway Board shows that of the 21,964 passenger vehicles on Class I. railways 38·6 per cent. are lighted by gas and 56 per cent. by electricity.

An Overspeed Test House.

IN order to eliminate any chance of damage to life and property while carrying out tests on high-speed machinery, such as turbo alternators, water-wheel driven generators, fly-wheels of motor generators, &c., the Metropolitan-Vickers Electrical Company, Ltd., has recently erected, at a considerable expense, an overspeed test house at the Trafford Park Works, in which speed tests may be carried to destruction, if desired, without risk to the attendants. In designing this house and arranging its equipment, the company had in mind the testing of two distinct types of electrical machines, namely, low-speed water-wheel sets of large diameter and weight, and high-speed turbo rotors of great length but only of medium diameter and weight. For the mechanical testing of turbine rotor discs and similar appliances, very high speeds, are, of course, involved. Having decided upon the leading dimensions dropped from aeroplanes by covering them with bags of sand and rafts of timber. In the structure we are about to describe the same line of reasoning was adopted, but as the forces to be resisted are reversed the absorbent lining is inside.

Views of the interior and exterior of the test house are given in the half-tone engravings on page 716 and herewith, while the drawing shows very clearly the lay-out and details of construction. The test house is large enough to deal with a rotor of 14ft. 6in. diameter, and will take a shaft up to 40ft. in length. Referring to the cross section, it will be seen that a timber lining is held in place by a light steel framework, and that the space between it and the ferro-concrete shell is filled with bags of sand. In the construction of the building 800 cubic yards of concrete, 30 tons of steel, 2000 cubic feet of timber, and 7000 cubic feet of sand were used, exclusive of the moving door, which consists of a slab of reinforced concrete lined with wood, carried on spring mounted wheels, and weighing 17 tons. The building is conveniently situated with respect to the heavy machine shop, where the work to be tested can be erected under the main cranes, and loads of 120 tons can be handled.



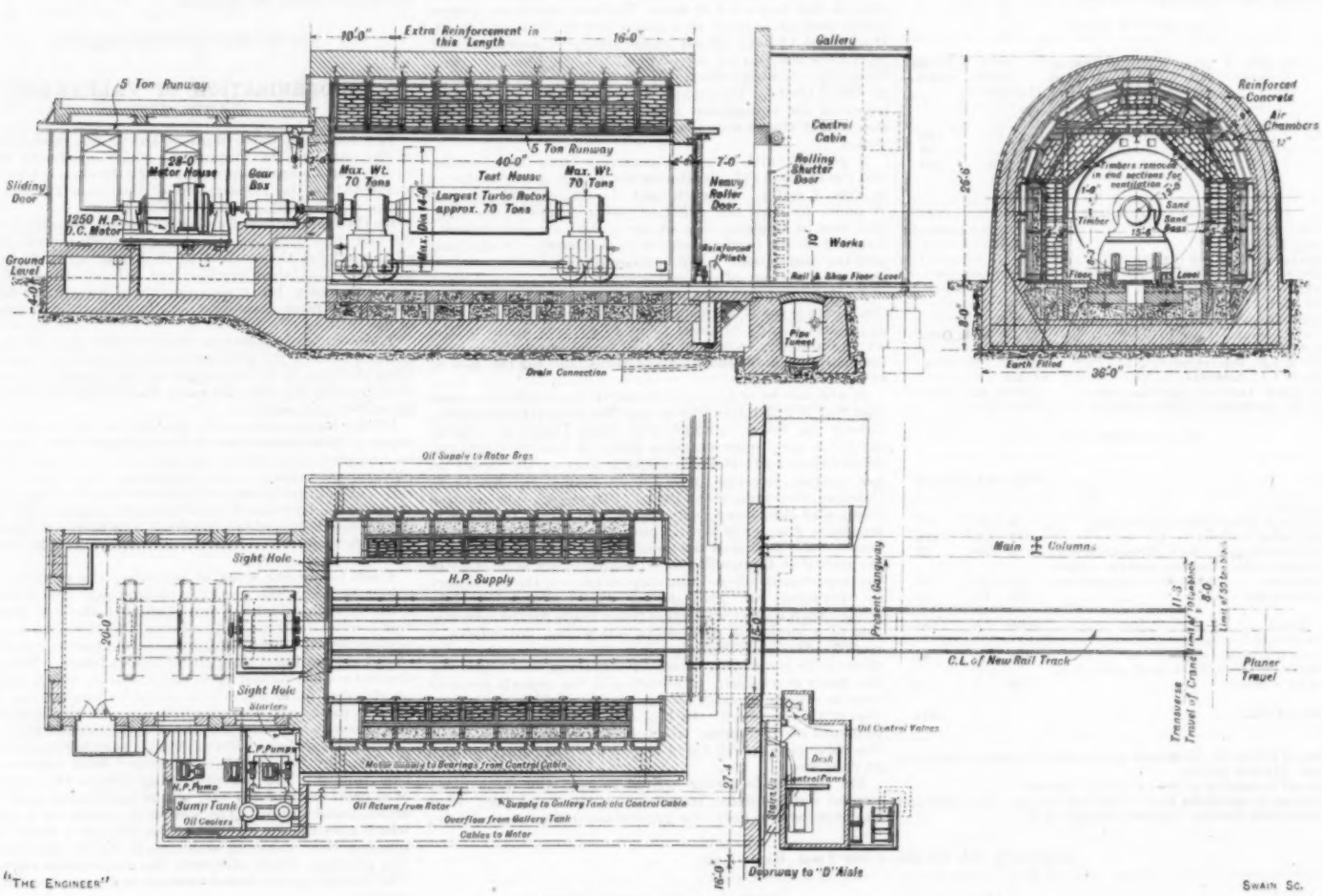
EXTERIOR OF REINFORCED CONCRETE OVERSPEED TEST HOUSE

A heavy standard gauge railway is provided between the test house and the shops, and two specially designed bogies are used for carrying the rotors to be tested. The bogies are machined on to the top face, to carry the bearing pedestals, and have machined landing faces on the underside. The axles are set so that the landing faces pass over the sole plates, which are fixed the full length of the test house. A clearance of 1¼in. is allowed. An overhead runaway is available for light loads in both the pit and motor house.

When a rotor has been mounted on the bogies in the main shop, the bogies are tied together by tie bars at the proper distance apart. The haulage gear is then coupled up and the bogies hauled into the pit. When approximately in the position required, each bogie is jacked up by hydraulic jacks, and a 2in. packing plate is inserted between the landing faces, and the sole plates. Each bogie is then brought into correct alignment, and bolted down solid on the sole plates, but it will be noted that the axles have been freed from all load. Thus all inaccuracy due to wear of axles or rails is eliminated. With a total symmetrical load of 120 tons, the load on each axle is 30 tons. Comparing this with 18 tons to 20 tons per axle for locomotive work, and making due allowance for the difference of speed, it is fairly moderate, and has the advantage that simple bogies are possible.

The driving motor and the permanent change speed gear are housed in an extension of the test pit,, which is completely cut off except for a tunnel, through which the driving shaft passes. The motor is of Metropolitan-Vickers standard high-speed type, suitable for operating on a 500-volt direct-current circuit. This motor will deliver continuously 1800 horse-power at the shaft, when running at 1800 revolutions per minute, speed regulation being obtainable between 700 and 1800 revolutions per minute. The set is self ventilating. Air circulation by fans on the armature provides the required cooling effect. The complete motor is mounted on a bed-plate, which again is carried on cross slides, so that the motor shaft can be brought into line with any desired shaft of the gear-box. Flexible connections in both oil and electrical circuits are made, so that no long delay will be necessary when changing over from one gear to another. A permanent magnet generator driven by the motor supplies the energy necessary for the distant speed indicator.

The change speed gear-box is of the three spindle totally-enclosed type, mounted on cross slides, so that any spindle may be brought into line with the test shaft in the test house. The gear is arranged with the wheel in the centre, and a pinion on either side. Each pinion runs in three bearings, and the wheel in two. The lubrication is on the low-pressure flood system. The gear is of high grade forged steel, and the teeth are of the machine-generated, double-helical type, solid couplings being provided at the ends of each spindle. The gear ratio is 4·04 : 1 for one pinion, and 2·28 : 1 for the other. The coupling shaft between the gear-box and the rotor to be tested is used as a safety device, as well as a driving shaft. It is specially made for the particular work in hand, and designed to sever in the case of any serious disturbance taking place during a test, and so save the gear-box from damage. The coupling used at the test pit end is of the large diaphragm type, which allows for slight out of



ARRANGEMENT OF TEST HOUSE

of such a building, the next consideration was to calculate what strength of structure was required to withstand the flying fragments of a burst rotor, for instance, for it must be borne in mind that the stored energy in a turbo rotor, 20 tons in weight, 2ft. diameter, at a speed of 3000 revolutions per minute, is somewhere in the neighbourhood of 30,000 foot-tons. Experience gained on the battlefields in recent years in connection with the construction of shelters for troops, demonstrated that it was necessary to protect concrete shelters from the effects of bombs

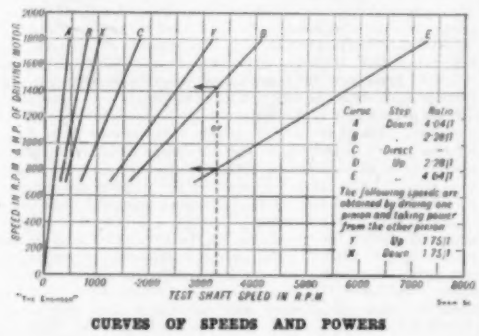
alignment, and prevents the transmission of vibration.

The oil system provides both low and high-pressure oil to the test house, and low pressure only to the motor house. An overhead tank of 1000-gallon capacity supplies oil to all bearings at a pressure of 30ft. head, and then passes on to a sump tank in the basement of the pump room. The oil is then again pumped to the overhead tank, passing through strainers and coolers on its way. For that purpose two direct-coupled motor-driven centrifugal pumps are installed, each pump having a capacity of 90 gallons per

minute at a speed of 1440 revolutions per minute. A high-pressure supply is in parallel with the low pressure, and can be maintained by hand pump in emergency, but, for service work, a direct-coupled motor-driven positive pump, capable of delivering 15 gallons per minute, against a pressure of 200 lb. per square inch, is available. This high-pressure oil supply is provided for lifting the rotors on an oil film thereby facilitating the starting, as otherwise the starting effort would be too high for the driving motor and gears. The pump is fitted with a by-pass or slipping valve, which can be set to deliver any quantity of oil, from 2 gallons per minute to full capacity, to meet the requirement of any bearings in use. The motor switchgear is fixed on the wall of the pump house in a convenient position.

The control cabin is situated in an elevated position in the main shops, and is equipped with all the control gear for running the test house. The main features are :—Speed control ; speed indicating instruments ; power indicators ; rheostatic braking to bring the driving motor quickly to rest ; full control of the generator supplying power to the motor ; tell-tale indicators and pressure gauges for the oil service ; instantaneous stop valves for oil service in case of a pipe bursting ; and a signal system between the cabin, pit and motor house. This system centres all control, and enables all data to be logged and compared. The work is carried out in quiet and convenient conditions.

The speeds and powers, which are available in the test house, are shown by the curves in the accompanying diagram. It is a coincidence that the motor gives 1800



CURVES OF SPEEDS AND POWERS

horse-power at 1800 revolutions per minute, so that both power and speed, with any gear in use, can be given with one curve. For example, if it is required to run a test at 3300 revolutions per minute, either the 2·28 : 1 or the 4·04 : 1 gear may be used. The output of the motor will be 1440 or 810 horse-power approximately. The gear is designed to transmit three times full load torque at starting from standstill, and with the use of the high-pressure oil service, heavily-loaded bearings can be floated, so that easy starting up is assured. Speeds beyond the limits given on the curve are obtained by supplementary gearing. If a further step-up of 3 to 1 is used, speeds over 20,000 revolutions per minute can be obtained.

In ordinary routine work, the dynamic balancing of rotors is carried out in this house, and any necessary adjustments made up to any desired overspeed. Deflections can be measured, critical speeds checked and recorded by means of a vibrograph. Rotating parts may be viewed by an oscilloscope, records taken by high-speed camera, and measurements made by electrical apparatus, however small they may be, can now be magnified to give readable and comparable records.

THE FEDERATION OF CHAMBERS OF COMMERCE OF THE BRITISH EMPIRE.

THE general arrangements for the eleventh Congress of the Federation of Chambers of Commerce of the British Empire, which is to be held in Cape Town during the first week of October, 1927, are well advanced.

The Congress will meet under the patronage of the Earl of Athlone, Governor-General of the Union of South Africa, who hopes to open the proceedings in person, whilst the importance which the Union Government attaches to the occasion is demonstrated by the fact that the delegates will be entertained at a state banquet, an honour which has been conferred on only four occasions since the institution of the Union in 1910.

Elaborate arrangements are being made by the Association of Chambers of Commerce of South Africa, with the assistance of the Union Government, in order that, when the actual business of the Congress has been concluded, the delegates may have the opportunity of visiting the principal cities and other points of interest in South Africa under the most favourable conditions. A train, placed at the disposal of the party by the Government, will leave Cape Town on the Monday following the Congress week for a tour of some twenty-five days, arriving back in Cape town on November 4th, a date which will enable the United Kingdom delegates to be back in England by November 21st. The itinerary will include Oudtshoorn, Port Elizabeth, Bloemfontein, Kimberley, Mafeking, Bulawayo, the Victoria Falls, Salisbury, Johannesburg, Pretoria, Maritzburg, Ladysmith, Colenso, and Durban. An additional supplementary tour of a week will be organised for those who may wish to visit the Northern Transvaal and Portuguese East Africa. Everything possible will be done to enable the visitors to gain a clear impression of the achievements and potentialities of the country.

Travelling in South Africa will be free of charge, and, moreover, the Union-Castle Line is quoting a specially reduced first-class return fare to Capetown ; the steamer will leave Southampton on September 16th, and is due to arrive two days before the Congress is timed to commence.

The President of the Federation, Lord Kylsant, will preside over the Congress sessions ; he will be supported by Sir Edward Davson, chairman of the Council of the Federation.

Inductance Design for High-power Radio Transmitters.

"SOME Notes on Design Details of a High-power Radio Telegraphic Transmitter using Thermionic Valves" is the title of a paper recently read before the Wireless Section of the Institution of Electrical Engineers by Dr. R. V. Hansford and Mr. H. Faulkner. The paper deals with certain specific details of design and operation of the high-power valve transmitter installed at the Rugby wireless station, and is divided into six parts, but we only propose to refer to certain points concerning the design of the main inductance.

The design of the inductance at Rugby was based on the experience gained at Northolt, where the necessity for the provision of a substitute for a large copper tube inductance, which had a very high resistance, led to the manufacture by the Post Office engineering department of its first large stranded wire inductance. The first step in the design of the Rubgy inductance was to find the maximum number of strands it was practicable to utilise, and inquiries revealed the fact that a cable with 6561 strands was probably the limit of the manufacturing plant in this country. It was also felt that spiders about 16ft. in diameter were as large as could be conveniently handled without making the entire structure unduly heavy. A curve in the paper indicates that it is desirable that the diameter of the strands of a 6561-strand cable should be about ·007in., and it was therefore decided to use 6561 strands of No. 36 S.W.G. wire. The fact that the calculated decrement is more than doubled by an increase in the diameter of the strand from No. 36 to No. 32 is of interest. Before finally choosing a conductor composed of 6561 No. 36 wires, an estimate was made of the current-carrying capacity, for on account of the nature of the frame it was desired that the heating of the cable when fully loaded should not be excessive.

Experience with the coil installed at Northolt showed that a dissipation of 1 watt per square inch of surface of the cable, assuming that all the losses in the coil were dissipated in that way, resulted in a very reasonable rise in temperature, and this value was therefore taken as a basis. Based on calculations given in the paper, it was assumed that a maximum decrement of ·003 could be anticipated. It corresponds to a maximum resistance of 0·16 ohm at 16,000 cycles when using the full aerial. On the basis mentioned the coil would be capable of carrying 700 ampères, which represents full-load output on the assumption of 1 ohm total resistance of the aerial circuit. As actually used, the coil has a decrement of 0·0014, and the rise of temperature at the surface of the cable after a run of one hour at 750 ampères is only 5 deg. Cent.

An exacting specification was prepared for the stranded wire cable, and it speaks well for the British cable manufacturers, that although no such cable had been manufactured previously in this country, two firms, namely, Henley's Telegraph Works Company, Ltd., and Connolly's, Ltd., eventually produced considerable quantities of cable which met the specification in all respects. Dielectric loss in the framework on which the conductor is supported may be responsible for a considerable proportion of the resistance of a transmitting inductance, and American whitewood has proved to be very suitable for the construction of such a framework. The actual form of construction adopted is shown in Figs. 1 and 2, where it will be gathered that the conductor is wound on the radial spokes of spiders, which are of American whitewood, and a continuous variation of inductance is obtained by the relative movement concertina-wise of these spiders on a framework which is also made of American whitewood. Each spider consists of spokes fastened to a central hub, which is provided with boxwood rollers in order to facilitate its movement along the supporting beams. The spokes are slotted and the slots are provided with saddles and wedges, and in order that no undue stress may be placed on the cable at the points of support, the slots and saddles are curved. The wedges are provided in order that the turns of the coil may be tightly gripped by the saddles, the sides of the slot thus ensuring intimate contact between the cable and the framework.

This arrangement serves two purposes, for it assists

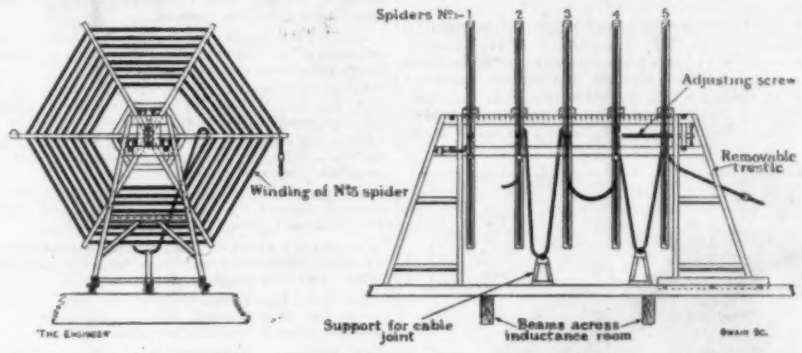


FIG. 1—GENERAL ARRANGEMENT OF AERIAL TUNING INDUCTANCE

construction by enabling the coil to be wound with a good tension and to be definitely held in position length by length as it is wound, and it prevents the burning which occurs under high-frequency voltage conditions if the cable only rests lightly upon its supports. The burning arises from the fact that as the wood has a higher permittivity than the air and as these dielectrics are in series, the voltage gradient across the latter may be greater than it is across the former. As the air has less dielectric strength, local breakdown across the small air gap will very easily take place, and the sparking from the cable covering to the wood may cause both to smoulder or burn. To prevent any distortion of the spokes arising as the result of the tension applied stiffening pieces were formed across the ends of the spiders. The turns were pulled up by means of a clamp and a calibrated spring ratchet. By means of a wood screw, fitted to the end spider, a fine adjustment of the inductance can readily be obtained. An important factor that had to be taken into consideration in fixing the proportions of the coil was the possibility of voltage

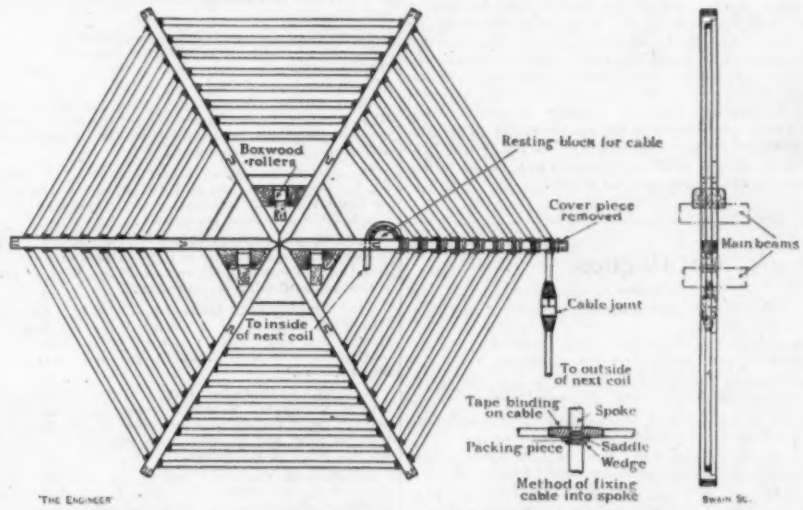


FIG. 2—DETAILS OF SPIDER OF AERIAL TUNING INDUCTANCE

breakdown, which may occur (*a*) between turns, (*b*) between spiders, and (*c*) to earth or surrounding objects. (*a*) For purposes of design a maximum R.M.S. voltage of 200,000 volts was assumed. Between adjacent turns the voltage to be allowed for was comparatively low, being approximately 7000 volts on the assumption of four spiders and eight turns per spider. As there was no question of voltage breakdown across the air gap in this case, it was only necessary to consider the dielectric strength of the framework from the high-frequency point of view. The test previously adopted as the standard to be applied to selected test pieces of the wood used for inductance frameworks, &c., consisted of the application of 32,000 volts at high frequency across a sample 1in. square and 4in. long. No trouble had been experienced in obtaining whitewood which would withstand this test, and a minimum distance of 4in. between turns was decided upon, thus giving a factor of safety of 5 to allow for variations in humidity and quality of the wood.

(*b*) The dielectric to be considered between spiders was air, with the exception of a short length of the supporting framework, and on the same assumptions the maximum voltage to be allowed for was 100,000 volts. The basis used in this case was that a factor of safety should be

allowed upon the voltage at which visible corona would appear. This voltage was calculated from the expression—

$$e_0 = 21{\cdot}2\left(1 + \frac{0{\cdot}301}{\sqrt{r}}\right) r \log_e \frac{s}{r} \times 2 \times 0{\cdot}72,$$

where

r = diameter of conductor = 1·75in.;
s = distance between conductors;
e_0 = visible corona voltage.

A multiplying factor of 0·72 was allowed, on account of the use of stranded wire, and a factor of safety of 2 was allowed on the voltage. This calculation gave a minimum spacing of 10in., and the spiders were actually arranged for a minimum spacing of 1ft.

(c) Similar calculations gave 10ft. as the minimum distance that the high-frequency cable should be from earthed conductors of similar dimensions.

An Ismailia-type Tidal Flap Valve.

THOUGH the Ismailia valve was originally introduced by the patentee, Mr. E. C. Bowden-Smith, of 17, Victoria-street, London, S.W. 1, as a pump valve in multiple form for large pumps—as, for example, the valves described in our issue of February 5th last—the principle on which it is constructed has proved itself adaptable for other purposes. The accompanying engraving shows a large

TIDAL FLAP VALVE

tidal flap valve, with a socket cast on the back for taking the end of a 27in. concrete pipe. This valve was made by Ham, Baker and Co., Ltd., of Birmingham, to the order of the borough engineer for Widnes, and is of comparatively light type, as it is intended for inland purposes. When severe wave action has to be contended with on exposed coasts, the valves are made of greater strength. Free seating of the flap is secured by the Ismailia principle, or rolling action of the fulcrum which takes the place of an ordinary hinge, or eye working round a pin, as was fully explained in the article referred to above.

Catalogues.

R. F. WINDER, Ltd., Cross Belgrave-street, Leeds.—Electrical surplus goods list.

ALFRED HERBERT, Ltd., Coventry.—The ninth edition of the small tools and machine shop accessories catalogue.

F. WIGGLESWORTH AND CO., Ltd., Clutch Works, Shipley.—Data book 2087, dealing with "Allis Texrope" drives.

FREDERICK PARKER, Viaduct Works, Leicester.—Catalogues of plant for buildings, road-making and quarry working.

JOSEPH KAYE AND SONS, Ltd., Lock Works, Leeds.—New illustrated catalogue of oil feeders, cans, petrol funnels, &c.

LEHMANN, ARCHER AND CO., Ltd., 5, Farringdon-road, London, E.C. 1.—List No. 3 of C.A.V. tools and "Wade" lathes.

S. H. MORDEN AND CO., Ltd., 18, Dartmouth-street, London, S.W. 1.—Booklet dealing with "Flextool" power-driven hand tools.

F. BRABY AND CO., Ltd., Petershill-road, Glasgow.—Catalogue dealing with the recently introduced "Eclipse" pressed steel stairs.

RANSOMES, SIMS AND JEFFERIES, Ltd., Orwell Works, Ipswich.—Brochure giving particulars of electric trolley omnibuses.

CROFTS (ENGINEERS), Ltd., Thornbury, Bradford.—Leaflet No. 2612, giving particulars of ball and roller bearings kept in stock.

HOPKINSONS, Ltd., Britannia Works, Huddersfield.—Folder illustrating the various types and sizes of spring safety valves made.

CROFTS (ENGINEERS), Ltd., Bradford.—Leaflet No. 268, of belt tension devices; leaflet No. 2615, on "Crofts" standard back gears.

W. CROCKATT AND SONS, Ltd., Darnley-street, Glasgow, C. 1.—Leaflet dealing with the Crockatt Simplex patented valve re-seating machine.

CHADDERTON CONVEYOR COMPANY, Ltd., Radcliffe, Manchester.—Catalogue of conveyors and elevators for boxes, packages and barrels.

JAMES KEITH AND BLACKMAN COMPANY, Ltd., 27, Farringdon-avenue, London, E.C. 4.—Brochure H 1 on boilers for heating and hot water supply.

STEWARTS AND LLOYDS, Ltd., 41, Oswald-street, Glasgow, C. 1.—Loose-leaf folder containing tables of capacities and properties of steel tubes.

BURMEISTER AND WAIN, Ltd., Copenhagen, Denmark.—Descriptions of the motor cargo liners Danmark, Peisander, Touraine and Orestes.

SAMUEL OSBORNE AND CO., Ltd., Clyde Steel Works, Sheffield.—Booklet, giving the prices, sizes and types of "Mushet" high-speed steel reamers.

WM. GEIPEL AND CO., 84, Thomas-street, London, S.E. 1.—Booklet illustrating and describing the manufacture and uses of "Plania Electrodes."

THE YORKSHIRE PATENT STEAM WAGON COMPANY, Hunslet, Leeds.—Publication W.G. 10, illustrating and describing the W.G. model 6-ton wagon.

E. G. HERBERT, Ltd., Levenshulme, Manchester.—Catalogue Section A on "Rapid" metal-sawing machines and "Rapidor" saw-sharpening machines.

ACCLES AND POLLOCK, Ltd., Oldbury, Birmingham.—Loose-leaf catalogue, giving particulars of special sections of weldless steel tubing for all purposes.

STANDARD TELEPHONES AND CABLES, Ltd., Connaught House, Aldwych, London, W.C. 2.—Booklet dealing with the "Standard" public address systems.

SIEMENS BROTHERS AND CO., Ltd., Woolwich, London, S.E.18.—Catalogue on ebonite, containing much information on its origin, properties, machining, &c.

AUTOMATIC AND ELECTRIC FURNACES, Ltd., 173, Farringdon-road, London, E.C. 1.—Section K catalogue of Wild-Barfield high-temperature electric furnaces.

GARRARD GEARS, Ltd., 109, Kingsway, London, W.C. 2.—Publication No. 2, dealing with parallel-type Garrard gears and illustrating various installations.

THE BRITISH OXYGEN COMPANY, Ltd., Edmonton, N.—Two booklets entitled "Hints on Gas Welding" and "Hints on Oxygen Metal Cutting (Hand Apparatus)."

GOODBRAND AND CO., Ltd., Britannia Foundry, Stalybridge.—Booklet illustrating and describing the patented "Safety-Collar" fuel economiser for high pressures.

SIR W. G. ARMSTRONG, WHITWORTH AND CO., Ltd., Kinnaird House, Pall Mall, London, S.W. 1.—Brochure No. 345 on the manufacture and use of high-speed and other tool steels.

THE BRYAN DONKIN COMPANY, Ltd., Chesterfield.—Catalogue, entitled "Gas Exhausting and Compressing Plants," illustrating the various types made and several typical installations.

THE UNDERFEED STOKER COMPANY, Ltd., Africa House Kingsway, London, W.C. 2.—Folder giving a detailed description of the Beaumont cable drag scraper system for coal storage.

MIRRLEES WATSON COMPANY, Ltd., Scotland-street, Glasgow.—An illustrated brochure describing the steam ejector air pump and centrifugal condensate pump installation on the ss. Coracero.

DARLINGTON FENCING AND WIRE COMPANY, Ltd., Hopetoun House, Lloyd's-avenue, London, E.C. 3.—Leaflet describing the "Darfen" cross-cut motor saw; and a price list of wire fencing.

SIEMENS AND ENGLISH ELECTRIC LAMP COMPANY, Limited, 38, Upper Thames-street, London, E.C. 4.—Folder containing a list of the types of lamps made, with a novelty called the "milometer."

G. AND J. WEIR, Ltd., Cathcart, Glasgow.—A booklet dealing with the use of "Monel" metal and pure nickel in the dyeing, bleaching and finishing machinery for cotton, woollen and silk textiles.

COLAS PRODUCTS, Ltd., 38, Parliament-street, London, S.W. 1.—A booklet describing the uses and application of "Colas," a cold bitumen used for the surfacing, reconditioning and patching of roads.

COOKE, TROUGHTON AND SIMMS, Ltd., Buckingham Works, York.—Publication No. 587, entitled "A Decade of Progress in the Design and Manufacture of Scientific Optical Instruments and Apparatus."

POTT, CASSELS AND WILLIAMSON, Motherwell, near Glasgow.—Catalogue dealing in detail with "Weston" centrifugals and their accessories. Copies of this catalogue are also issued in French and Spanish.

MASTER BUILDERS COMPANY, 7016, Euclid-avenue, Cleveland, Ohio, U.S.A.—Leaflet introducing "Dycrome," a surface treatment for hardening concrete floors, producing by chemical reaction cloud-like colour effects.

WESTINGHOUSE BRAKE AND SAXBY SIGNAL COMPANY, Ltd., 82, York-road, London, N. 1.—Catalogue entitled "Air Brakes for Road Vehicles," illustrating many types of road vehicles to which the brakes have been fitted.

F. D. WARD, 127–139, Queen Victoria-street, London, E.C. 4.—Sectionalised catalogue of the products of the Greenfield Tap and Die Corporation, Greenfield, Mass., U.S.A., for which Mr. Ward acts as Brish representative.

THE SUPERHEATER COMPANY, Ltd., 193, Strand, W.C. 2.—Pamphlet No. L 17, "'M.L.S.' Combination Superheater Header and Regulator"; pamphlet No. L 6, "Modern Locomotive Superheating," Part I.; pamphlet No. L 4, "'M.L.S.' Superheaters."

RUSTON AND HORNSBY, Ltd., Lincoln.—Publication No. 5004, dealing with the "Ruston" airless injection cold-starting oil engines, also giving a description of the patented fuel distributor gear and illustrating a number of typical plants in various parts of the world.

SIR HOWARD GRUBB, PARSONS AND CO., Walker Gate, Newcastle-on-Tyne.—Publication No. 1, entitled "Astronomical and Optical Instruments," describing the company's works and illustrating a large number of astronomical installations in observatories at home and abroad.

THE BRITISH THOMSON-HOUSTON COMPANY, Ltd., Rugby.—List No. 2531–B, "Fabroil Gears and Blanks"; list No. 4172, "Oil Immersed Circuit Breakers, type OY 209"; price list No. 5115–D, "A.C. Rheostatic Rotary Starters"; list 4401–D, "Drum Type Relays"; list No. 4327, "Switch Fuses for Outdoor Service."

WHITWORTH SOCIETY.—The fourth annual commemoration dinner of the Whitworth Society was held at the Holborn Restaurant, London, on Tuesday, December 21st, that day being the anniversary of the birth of Sir Joseph Whitworth. The chair was taken by Dr. F. P. Purvis (Wh. Sc., 1869), and about seventy persons were present. Seven of the scholars appointed during the current year attended as guests, and some most interesting speeches were made. Mr. Thos. Sugden, of London (Wh. Sc., 1873), was elected president to take office at the summer meeting, which will be held in Derby in July, 1927, when it is proposed to place a wreath on the tomb of Sir Joseph Whitworth at Rowsley. There are now about 500 members on the roll of the Society, and about 250 copies of "The Whitworth Book" have already been sold. Application should be made for purchase forms to the hon. secretary, Whitworth Society, care of Institution of Mechanical Engineers, Storey's-gate, Westminster, S.W. 1.

Provincial Letters.

THE MIDLANDS AND STAFFORDSHIRE.

(From our own Correspondent.)

Outlook for 1927.

A HIGHLY optimistic view as to the industrial prospects in 1927 is taken by iron and steel masters, engineers, manufacturers and industrialists generally in the Midlands. In some quarters they go so far as to assert that there is a better prospect and a clearer outlook for industry than has been known since the war. To say that Midland industrialists will have no regrets at the passing of the black year 1926 is but to put it mildly. For each and everyone of them it has been a gruelling time, one which they do not care to look back upon. They have got through it by dint of perseverance, and now they hope the silver lining may replace the black cloud which has so recently passed. They point to many indications of better prospects for 1927. The labour situation is more settled, and everywhere there are signs of improving trade. The shipbuilding industry, which affects so many Midland trades, at last appears to have entered upon a period of activity. Engineers of all classes have good contracts on hand, and are demanding more material than the iron and steel works can, at the moment, produce, while manufacturers, no matter what their line, speak hopefully of the future. It is well to recall the fact that the period through which we have passed has effected a pretty complete clearance of manufacturers' and merchants' stocks. The former may, therefore, make a fresh start with the assurance that for some little time at all events over-production need not be feared. Success in recovering our former industrial activity will depend on our ability to sell at prices which customers both at home and overseas can pay. Plans for a resumption early in the New Year by the heavy industries of the Midlands and Staffordshire are being pushed forward with all rapidity, and the situation is gradually taking on a more favourable appearance as fuel difficulties diminish. The shortage and high price of coke are still retarding influences, however. At the moment the high cost of coke is the great obstacle to the restoration of trade to its normal condition. Everything depends upon how soon the basic industries can get into their stride and the price they can afford to accept for their output. It is very welcome news that this week Alfred Hickman, Ltd., of Spring Vale Ironworks, Bilston, have commenced to blow in three of the blast-furnaces which have been idle since the beginning of May last. A large number of workers have been engaged on preparatory work, and it is hoped in the course of a couple of weeks to have working the full complement of 2000 men. The firm is, I understand, well placed for orders, and realising the great potential demand for steel, is optimistic as to its ability to keep going once started. Only two of the furnaces from which foundrymen draw supplies have so far been restarted in this part of the country. The prices for deliveries in the New Year have to be fixed so high on the basis of current demands for coke that consumers will not pay them. In the circumstances, arrangements for blowing-in furnaces are tentative in the case of those smelters who have to go on to the open market for their coke. It cannot be too highly stressed that, although there are many inquiries, and prospects seem bright, anything like a general revival in the basic industries of the Midlands cannot be looked for till collieries are ready to break with high prices, and until the basic industries get well under way the other trades of the country must perforce go slow. The engineering industry in the Midlands is looking forward to a revival, and when iron and steel supplies become more normal, an expansion of trade is confidently anticipated. There are many orders on hand, particularly in the motor and electrical branches. A hopeful feeling is experienced in industrial Shropshire. Hay Bridge Ironworks, idle for years, are, it is understood, again to be the scene of activities, and extensive developments are taking place at the Sinclair Iron Company's Ketley Works. The new power station at Buildwas, in the Ironbridge area, promises increased work, while a sugar beet factory is to be erected at Allscott, near Wellington, for the 1927 crop. All round, therefore, there appears to be every prospect of a prosperous new year.

Industrial Peace Prospects.

Iron and steelmasters and industrialists generally in the Midlands and Staffordshire, to whom the question of peace in the country's industries is of such vital importance, are convinced that prospects for industrial peace in the coming year the country over are better than they have been for many years. It is pointed out that the trade unions will not recover from the effects of the general strike and the prolonged coal stoppage for many months to come. Their finances are depleted to such an extent that powerful unions have found it necessary to impose levies to rebuild their resources, while others have been compelled to reduce salaries and impose rigid economies. If only for this reason the approaching year will probably be free from serious industrial strife. In general the trade union movement will be almost completely absorbed throughout the year in rebuilding its forces and funds. The coal industry, the strike in which wrecked the chances of a really good year of trade, has been shaken to its foundations by its blind following of Mr. Cook, but the agreements entered into in the various districts should result in stabilisation for at least three years. On all hands, it is hoped that the optimism expressed in this direction will not prove misplaced.

Market Conditions.

Practically the whole of the iron and steel works in the Midlands and Staffordshire have been idle this week. A few of the mills and foundries started at mid-week, and some of the engineering concerns, which have much work on hand, also made an earlier resumption than is usual. The weekly meeting of the Midland iron trade in Birmingham to-day—Thursday—was poorly attended, and little business was transacted. Such business as was negotiated followed the market tendencies which had previously

developed. Steel quotations tended to advance, but it was difficult to get firm prices. Inquiries were in circulation for supplies in the New Year, and they lead one to the conclusion that some excellent contracts should be forthcoming at the January quarterly meeting.

Steel Trade Hopes.

Everything points to a year of really good trade in the steel industry. Orders for many thousands of tons of material have accumulated during the enforced stoppage of the past seven months, and it is well known that there are engineering projects in prospect which will make very heavy demands upon the productive resources of the steel furnaces. The furnaces will be got going as soon as possible in the New Year, and they should be kept at full pressure for at least the first six months of 1927. As the year ends the production of steel is being gradually expanded. Producers are being pressed for delivery under old contracts, and urged to state dates of delivery for new business. The latter, however, makers are not prepared to do. The increased activity at the shipyards has been such that there is now a shortage of material, especially plates, and work is having to be held up on this account. Quotations for steel plates have stiffened during the holidays, and many sellers now ask £9 per ton without guarantee of delivery. This represents a premium of about 7s. 6d. over the Association price. Constructional steel business has slackened during the past week or two, but fresh inquiries are anticipated now that the holidays are over. The price question is still an open one. No definite move has, as yet, been made by the Association on the question of advancing prices, but steelmasters are disinclined to quote. It is extremely difficult to get a firm price for any class of finished material. To-day, however, small steel bars were obtainable at £8 15s., and bedstead angles were quoted £9 7s. 6d. Sellers of continental steel, anxious to make "hay while the sun shines," offer continental joists at £5 13s. Antwerp, or £6 18s. delivered here. Foreign prices in most departments are easier. Semi-finished material is offered, billets being £6 2s. 6d. and £6 10s. for steel bars. There does not appear to be any rush to place orders abroad however. Many manufacturers entered into contracts during the strike which will ensure their supplies for some months to come. A good deal of finished material, including some consignments from Germany, is regularly reaching this district under these contracts. Fresh business, however, is not being given out, at any rate, in bulk. Much depends upon how native prices go when the furnaces are again in action as to what volume of business foreign producers will secure from Midland steel consumers.

Raw Iron.

Pig iron is still as scarce as ever. There is practically none on the market. No furnaces have been lit in this area beyond the two operating in Derbyshire, and their output has been booked up at £4 12s. 6d. Some iron, however, is promised for delivery towards the end of January. Derbyshire No. 3 has been offered at £4 5s. at furnaces, and Northamptonshire No. 3 is quoted £4 2s. 6d. Some bargains are stated to have been struck at half-a-crown below the latter figure. Some continental iron remains to be delivered at £5 10s. on old contracts, but no great quantity is being booked now. The whole position hangs on the price of coke. Until this price is down to normal pig iron cannot be produced by most Midland furnaces. There is every prospect, however, that furnaces in this area will not much longer be idle. Pig iron is too badly needed for producers not to realise the importance of an early resumption of output, but, at the same time, they cannot be expected to produce at a loss, and unless they can buy coke cheaper than it is at the moment quoted, they cannot afford to produce and sell at to-day's figures. Last January when coke was much cheaper than it is Derbyshire blast-furnacemen were getting £3 6s. 6d. for foundry iron, and Northamptonshire makers £3 2s. To-day even at £4 5s. for Derbyshire and £4 2s. 6d. for Northamptonshire production costs are such that makers hesitate to restart furnaces. As more abundant supplies of pig iron become available prices will naturally fall, and furnacemen are afraid of making contracts for coke unless they can secure equally lengthy contracts for iron. However, the position is a little clearer than it was a couple of months ago. Fuel values are falling, and ironmasters are hopeful of entering into contracts for supplies at prices which will justify the blowing-in of furnaces and the resumption of production of pig iron which is urgently needed in many quarters.

Staffordshire Finished Iron.

Ironmasters in Staffordshire have had an exceedingly trying time during the past twelve months, but they appear to be as optimistic, if not more so, as to the prospects for 1927 in the industry than they were a year ago. They have a large accumulation of orders on their books, and the demand for best class bars is likely to be larger this coming year than it has ever been. Engineers know the value of best Staffordshire bars, and their recent inquiries for supplies have been such as to inspire confidence in the future of the manufactured iron industry. Output, which was practically suspended during the coal strike, is now being resumed, and it is hoped to be able to satisfy all demands in the near future. Marked bars which twelve months ago sold at £14 are to-day making £14 10s., while Crown bars, which were £11 10s. to £12, to-day fetch the high figure of £12 12s. 6d. to £12 15s. Nut and bolt and fencing iron has been in small request of late, the makers' terms of £11 5s. per ton being considered prohibitive. Last January they were quoted £10 10s. to £11. During practically the whole of the year Black Country nut and bolt manufacturers have been using continental material for working up. To-day it is obtainable at £6 15s. per ton. With a margin like this between native and continental bars it cannot be wondered at that manufacturers close their eyes to the inferiority of the latter material. In this branch of the iron trade there is little prospect for the Staffordshire ironmaster. He cannot possibly afford to produce and sell at anything approaching foreign prices, and the Darlaston nut and bolt makers on their part cannot use the high priced Staffordshire bars and compete with their rivals using continental raw materials.

Sheet Prices.

The decline in galvanised sheet values continues. Some of the sheet mills are not at all well off for orders with which to start the New Year, and on 'Change in Birmingham to-day—Thursday—the price for 24 gauge galvanised corrugated sheets was marked down as low as £16 5s., making a fall of 30s. since the middle of November. Makers now have very little difficulty in obtaining supplies of fuel, but sheet bars are rather scarce. Most of these bars come from the Continent and cost about £6 7s. 6d. A few sheet bars are coming through from South Wales in satisfaction of old contracts. Consumers of sheets are not anxious to buy on a falling market, so that business is quiet. The export trade too is rather dull, but good shipments have been made lately to South America and the West Indies. It is interesting to note that whereas at the end of the old year prices of practically all materials stand higher than they did twelve months ago, galvanised sheets are cheaper by 7s. 6d. per ton than they were in January last, when they were quoted £16 12s. 6d. per ton.

Motor Engineering.

There is a feeling of great confidence in the approaching New Year in the motor engineering industry in the Midlands. The year 1925 closed with gloomy forebodings, but now it is believed industry is in for a time of labour peace. The motor engineering trade was seriously damaged, and confidence shaken by the devastating effects of the coal dispute, but the industry will readily respond to any revival. Many things point to this happy state of events coming to pass. In Coventry a good run of business is practically assured, agents' orders having now taken concrete form. Business, both home and abroad, has increased considerably since the industrial horizon cleared, and Coventry manufacturers speak hopefully of the prospects for 1927. In Wolverhampton motor engineering concerns have good order books. One firm of transport vehicle makers has just received several important contracts for over 150 goods and passenger vehicles, amounting to over £130,000. The Great Western Railway Company is renewing its road auxiliary passenger fleet with the latest type of low-loading omnibuses, and has placed orders for forty vehicles of this pattern. The War Office has placed repeat orders for goods vehicles, and further contracts for municipal omnibuses have been received, including some for overseas. In Birmingham and district, too, the outlook is rosy, and all that is apparently now required to ensure a good year for motor engineers is freedom from labour strife.

Overseas Orders for Shrewsbury Engines.

The Sentinel Waggon Works, Ltd., of Shrewsbury, has received orders for its "Sentinel" locomotives for the Great Southern Railways (Ireland), and for the Upper Chenab Canal Irrigation Works, India. The same firm has also received orders for two coaches for the Great Southern Railways (Ireland), three double articulated coaches for the Great Indian Peninsula Railway, and four coaches for the Ceylon Government Railways.

£28,500 Sewage Scheme.

The Sedgley, Staffordshire, local authorities have approved a £28,500 scheme for dealing with the whole of the sewage at Gospel End, which will necessitate the installation of a pumping plant for drainage in the Fighting Cocks area. The proposal is to be laid before the Ministry of Health, and, subject to its approval, the clerk has been authorised to open up early negotiations for the acquisition of the site for outfall works.

LANCASHIRE.

(From our own Correspondents.)

MANCHESTER.

Brighter Engineering Outlook.

THE improvement in the position of the engineering trades is less actual than prospective, although, according to a statement of an official of the Manchester branch of the Amalgamated Engineering Union, there has been a slight reduction in unemployment during the last few weeks among engineers in the Manchester district. Heavy electrical engineering has for some time been the most satisfactorily situated, but, judging from statements by firms in branches which have been but indifferently employed, the improvement seems to be fairly widespread. In the case of a large Manchester firm of machine tool makers, for example, it is stated that a slight change for the better is showing itself. Inquiries are being received and it is expected that many of them will be translated into orders after the holidays. One of the leading firms of boilermakers regards the prospects as fairly good, plenty of orders being on the books awaiting the time when steel supplies are readily available. There is also said to be a decided improvement in some sections of the textile machinery industry, and a fair number of inquiries are reported.

Local Contracts.

Several important contracts for engineering firms in the Manchester area have been made known during the last few days. The biggest is that which the Metropolitan-Vickers Electrical Company, Ltd., Trafford Park, has secured for the complete electrical equipment of the passenger service on the central section of the Southern Railway's London suburban system, the total value of the contract being about £603,000. It covers the supply of complete electrical equipment for 116 three-coach train units. In addition, electrical equipments are being supplied for 47 two-coach trailer units. Beyer, Peacock and Co., Ltd., of Gorton, has secured a contract for three "Garratt" locomotives for the Mauritius Railways. There seems, however, to be some uncertainty regarding the locomotive contracts which were reported last week to have been placed with this firm by the South African Union Railways. A further important order for a Manchester firm is for grain-handling equipment, including power plant, for the port of Santos, Brazil, placed with Henry Simon, Ltd.

Engineering Employers' Association.

At the recent annual meeting of the Manchester District Engineering Employers' Association, Mr. G. E. Bailey, of the Metropolitan-Vickers Electrical Company, Ltd., Trafford Park, Manchester, was re-elected president; Mr. H. Pilling, of Galloways, Ltd., boilermakers, being re-elected vice-president: and Mr. F. J. West, of West's Gas Improvement Company, Ltd., re-elected treasurer of the Association for the ensuing year.

Order for Tram Rails.

Orders for 1500 tons of tram rails have been placed with Bolckow, Vaughan and Co., and the Cargo Fleet Iron Company, Ltd., both of Middlesbrough, by the Manchester Tramways Committee.

"Safety First" on Tramways.

The Manchester Tramways Committee at its last meeting decided to abolish the indicator clocks at present employed on the system to register travelling time and to substitute for them as early as possible an electrical device operated from the tramcar and worked by contact with the overhead wires. The reason for the change is the number of accidents which have occurred to drivers and conductors during the past year or so whilst crossing the roads to the clocks.

L.M.S. Appointment.

To succeed Mr. R. W. Reid, who is now one of the new vice-presidents of the London, Midland and Scottish Railway Company, Mr. E. J. H. Lemon has been appointed carriage and wagon superintendent of the company. Mr. Lemon is at present divisional carriage and wagon superintendent at Newton Heath and Earlstown, Lancashire.

Non-ferrous Metals.

As usual, tin has been the most spectacular section of the non-ferrous metal market during the past week. For spot, this metal, after the slight recovery last reported, is now only fractionally short of £10 per ton lower than it was a week ago, and at the time of writing there is no sign of recovery, further ground having been lost since the market closed last Friday. The fall in forward metal, however, has been much less pronounced, and the margin between the two is now a good deal narrower than it has been for some considerable time. A quiet American demand and the prospect of a less favourable statistical position at the end of December have been the primary factors to bring about the decline in values. In spite of a turnover which was about 750 tons lower than in the previous week, copper has remained fairly steady, and up to the close last Friday very little ground had been lost. At the opening after the holidays, however, the tendency was towards further easiness. A favourable feature of this section of the market during the past week is that there has been a slight improvement in the volume of buying by home industrial interests, much of it for the cable-making industries. The turnover in the case of spelter has been less than half what it was in the previous week, but prices have kept firm and show little variation. A good deal less interest also has been shown in lead, although there has not been much change in values on balance.

Iron.

Interest in the iron and steel markets, both just before and since the Christmas holidays, has been at a very low ebb. At one session not more than a dozen people were present, and half of them spent most of their time solemnly examining a "dud" half-crown which one of them had had passed on him, and debating how best it could be used. Except for a notable easing tendency in the prices that are being asked for the small parcels of pig iron for prompt delivery that are on offer there has been little development in the market since last report. Middlesbrough prompt is now obtainable for delivery into the Manchester area at a little over 105s. per ton, with Scotch at about 117s. 6d. per ton. For January delivery, however, values remain fairly steady, with Middlesbrough quoted at about 100s. per ton delivered, and Scottish at 110s. to 112s. 6d., Derbyshire common irons ranging from 100s. for January delivery to 92s. 6d. to 95s. per ton for February. Whilst fair orders have been booked, demand at the moment is on a small scale, and is likely to remain comparatively restricted so far as important contract commitments are concerned until prices reach a lower and a more stable basis. Inquiry for manufactured iron is also slow for much the same reason, although until forge iron is obtainable at cheaper prices than those now ruling, quotations for bar iron will keep up. Lancashire Crown quality is on offer at £12 10s. per ton and second quality at £11 5s.

Steel.

This week, although in some sections of the steel market a fair inquiry has been reported, there has not been much actual demand and normal free buying is not anticipated until more rolling mill plant is working and supplies are available in bigger quantities. Prices, however, are firm, tank plates being quoted at £8 15s. to £8 17s. 6d. per ton, boiler plates at £11 10s. to £11 15s., joists and sections at £8 to £8 5s., basic bars at about £9, and re-rolled bars at from £9 5s. to £9 7s. 6d. per ton, including delivery to works in this area. There is little movement either in the case of galvanised sheets, with thick gauges easy at about £16 5s. per ton f.o.b. for Calcutta and Bombay specifications, and thin sheets quiet and nominally unchanged at £25 2s. 6d. per ton f.o.b. for Rangoons, £24 5s. for Bangkoks, £23 5s. for Straits, and £25 10s. per ton for

Shanghais. Buyers of continental steel are hanging back in expectation of lower prices in the near future. Semi-finished materials have eased off a little, with billets quoted at £5 17s. 6d. to £6 per ton, sheet bars at £6 2s. 6d., wire rods at £7 2s. 6d., steel bars at £6 12s. 6d. to £6 15s., light plates at £7 7s. 6d. to £7 10s., Siemens plates at £7 15s., and joists and sections at £6 10s. to £6 12s. 6d. per ton delivered to works in the Manchester district.

Scrap.

The demand for scrap non-ferrous metals has been very quiet, and in some instances a lower range of values is being quoted. For graded qualities, delivered to users' works, cast aluminium is now down to £70 per ton, selected gunmetal scrap is quoted at £52 to £53, brass rod turnings at £39, heavy yellow brass at £45, braziery copper at £52, clean light copper at £56 to £57, zinc at £25 to £26, and lead at about £28.

BARROW-IN-FURNESS.

Hematite.

Production has started and the furnaces at the various works have been lighted. In a week's time the output ought to be considerable, for apart from the demand by customers there will be a fair amount required for the steel departments, which will then be about to start. The New Year starts with brighter prospects in the hematite pig iron trade than has been the case for a considerable time, and granted a freedom from interruptions, 1927 should be a busy year. At Backbarrow the production of charcoal iron has ceased. In a sense, mostly sentimental, this is a pity, for it was the last charcoal furnace in this country. In the Furness district the manufacture of charcoal iron dates back to very early days, the woods in the district supplying the charcoal, but that fuel has reached such a price that it is impossible to use it. The furnace is now engaged upon the production of a high-grade iron, using East Coast coke and a local ore only. The ore comes from Cumberland. This iron is gaining attention more and more every week, and is gradually fighting and beating the foreign iron of a similar character. It is in ready demand with customers who require a malleable iron and is used for small buckles, boot protectors, &c. So keen were customers that the Backbarrow furnace was producing a couple of weeks before the others in the district. The hematite pig iron market remains firm, and is likely to continue in that state, in view of the strong position of makers.

Iron Ore.

There is a much better outlook for the local iron ore mines, and both in Cumberland and Furness it is expected that there will be greater activity than has been experienced for years. It is hoped that there will be an increased demand from outside this district, in view of the better state of the iron trade throughout the country. The foreign ore trade will revive, and cargoes are shortly expected. Prices remain firm.

Steel.

The steel works will resume on about January 3rd, and there will be a continuous run for months. Enough orders are held for rails, sleepers, billets, &c., to keep the works going for about six months, and in the meantime other orders are expected to come in, when it is possible to fix times of deliveries. Vickers are at a standstill on their shipbuilding side, to a large extent owing to lack of steel material, but deliveries are expected in January, and then there will be a steady increase in employment in the departments affected.

SHEFFIELD.

(From our own Correspondent.)

Steel Production Increasing.

WITH the holidays out of the way steel manufacturers are settling down in earnest, and a considerable number of open-hearth furnaces are operating. United Steel Companies are working six basic furnces at Templeborough, three acid and two basic furnaces at the Ickles, and three furnaces at Stocksbridge, while preparations are in hand for restarting two more at Templeborough. Vickers have six furnaces operating, Brown Bayleys three, Industrial Steels four, Browns and Bessemers two each, Firths and Andrews one each. Cammell Lairds started two acid furnaces at Grimesthorpe last week, and are starting five out of six basic furnaces at Penistone this week. It will be some time, of course, before the needs of steel consumers can be fully met. Supplies are wanted, not only to meet the urgent orders on hand but to replenish stocks. By the middle of January, however, the output of steel should be considerable, though still much below the average. A big trouble is the shortage of pig iron supplies. At the moment only a few blast-furnaces are operating in the area that supplies Sheffield and district, and most of the output of these furnaces is required for their associated plants. A quotation of 85s. f.o.t. is asked for Lincolnshire and Derbyshire foundry pig, and this is too high to encourage buying, and it will be another month or six weeks before supplies become normal. In the meantime operations at the steel works are proceeding on stocks of pig and scrap helped out with supplies of foreign pig. In the finished steel branches work is being held up, as the mills and forges lack raw material. Firms which have steel furnaces operating naturally require the output for their own mills, and it will be several weeks before outside demands can be generally met. The Trent Iron Company, Ltd., which is connected with John Brown and Co., Ltd., has started one blast-furnace, and operations are proceeding so satisfactorily that consignments of iron were dispatched before Christmas.

Big Electric Contract.

One of the best items of trade news that Sheffield has had for a long time was the announcement that the Metropolitan-Vickers Electric Company, one of whose principal works is in the city, has secured the contract for the complete electrical equipment of the passenger service on the central section of the Southern Railway's suburban system. The contract, which is for £603,500, covers the supply of complete electrical equipment for 232 motor coaches of 550 horse-power each, and 210 trailer coaches. The motors, of which two are fitted on each motor coach, are of the largest size used for motor coach service in this country. Each motor weighs 3¼ tons and develops 275 horse-power when supplied with direct-current at 600 volts. Eight-coach trains are commonly used on the system, each train having four motor coaches with a total of 2200 horse-power. The new contract will be shared by the Sheffield and Manchester works, the former making the motors and the latter the control equipment. A representative of the company states that the works at Sheffield, which have been fairly busy, will now be in continuous employment for a long time.

Giant Gas Engine.

The high-tension electrical system of the Staveley Coal and Iron Company, which serves the company's works and collieries, part of Chesterfield and several Derbyshire villages, has been so developed that it has been decided to erect a further giant gas engine at the Devonshire works generating station, and some of the big castings are being assembled there. Progress will depend upon the rapidity with which the parts of the double-tandem engine are received from Belgium. The first engine of the kind was erected at Staveley last year, and much interest was taken in it by engineers. The main frames, which are massive iron castings, weigh about 75 tons. The crank shaft, made in Sheffield, is a huge ingot-steel forging which, with the counterweights complete, weighs about 80 tons. These weights give some idea of the immensity of the engine. In course of time it is intended to erect a third gas engine of the same type at these works, where the plant works on waste gas from the coke ovens and generates a big proportion of the electric energy which the company passes through its 50 miles of mains from its three generating stations.

Sheffield's Lighter Trades.

Some improvement is recorded in the tool trades, and particularly in the file section. Work is being booked much more freely than has been the case for some time, and a considerable number of additional operatives have been engaged. Some trouble is still being caused by the shortage of file steel, but supplies are rapidly improving. The usual after Christmas slump is being experienced by the plate and cutlery trades. On the whole, manufacturers are quite satisfied with the way in which they have come through the serious industrial troubles of the year. Sales, of course, have been seriously affected, but a belated revival in the season proved gratifying. Interesting comments on the lighter trades of Sheffield appear in the current issue of the Chamber of Commerce *Journal*. "There has been," it states, "a big local output of safety razors and blades, notwithstanding the amazing action of the War Office in giving a spectacular contract to a foreign firm. The Navy continues to shave with the old-fashioned razor, and a good order has been placed in Sheffield. The subject of the placing of the Army's first safety-razor contract with an American firm is not being allowed to rest, and, although nothing can be done so far as the existing contract is concerned, there is not the least doubt that the attitude pursued by the Sheffield Chamber of Commerce, backed up by local members of Parliament, has paved the way for very careful consideration in the future of Sheffield's claim for consideration when the next contract of the kind is to be placed. With a fair assurance of industrial peace in the coming year, and with many arrears to make good, there is a greatly improved outlook for tools and most other things in which Sheffield specialises, and, as the people earn better wages, the demand for cutlery and plated goods may be expected to expand."

Water Scheme Completed.

Last week the Dearne Valley water system was coupled up with that of the Sheffield Corporation, and part of the minimum supply of 250,000 gallons per day which the Board has contracted with Sheffield to take, is available. The district over which this additional supply of water will eventually be distributed includes Hoyland, Wombwell, Darfield, Great Houghton, Bolton-on-Dearne, and Goldthorpe. The undertaking has involved the laying of about fifteen miles of pipe track, and will cost the Dearne Valley Water Board about £30,000.

Proposed Mining Institute.

The Board of Education has intimated to the West Riding Education Committee that it is not prepared at present to approve the whole scheme, costing £77,500, for the proposed Mining and Technical Institute at Whitwood, but plans for the erection of a portion of the buildings have been approved. The Committee has decided to proceed with this work at a cost of £40,000.

NORTH OF ENGLAND.

(From our own Correspondent.)

A Disastrous Year.

THE passing of 1926 will not be regretted by industrialists in the North of England. The year was one of the most disastrous in history, and not only the liquid assets, but also the cash reserves of most of the powerful firms have been considerably depleted, and in many cases completely exhausted. The stoppage of the fuel supply from the British coalfields for seven months of the year crippled almost every branch of industry. The iron and steel trade has, however, been the most serious victim. It was numbered first amongst the casualties, and its recovery will be longest delayed. To the men who find their livelihood in the iron and steel works, it must be a bitter reflection that a dispute in which they had no voice or direct interest—a strike, in fact, which was launched for the preservation of a working day shorter in extent and no more arduous or ill-paid than their own—should rob them of their employment for a longer period than the strikers themselves. The miners are now back at work, but there are still thousands of iron and steel workers in this area idle, and even yet it is impossible to indicate when the works will be back to normal. As indicative of the wonderful tenacity of the ironmasters, mention must be made of the fact that during the whole of the stoppage of the coal mines the production of Cleveland pig iron never entirely ceased, and although before the end came famine prices ruled, there was never a month when Cleveland exporters failed entirely to ship a few parcels of pig iron to foreign ports. Cleveland pig iron is especially esteemed by many continental consumers, for even when the price was 20s. to 30s. more than was quoted for foreign iron there were buyers abroad who placed orders with Cleveland merchants, and now that prices are down again to more reasonable levels there is an abundance of foreign orders to be placed as soon as delivery can be promised. Upon this fact, above all others, are founded the hopes now entertained of a rapid recovery for the Cleveland iron trade. A healthy home demand seems to be assured, but that is not enough. Cleveland is essentially an exporting area; in fact, the chief pig iron producing and exporting area in the United Kingdom, and its home trade must necessarily be supplemented by extensive overseas business before full employment can be found for the whole of the available blast-furnace plant. Before the war there were usually about seventy-two blast-furnaces in operation on the North-East Coast, and production in 1913 in this district alone approached 4,000,000 tons, of which 750,000 tons were shipped abroad. Much of that foreign trade has never been recovered since the war, and even before the coal stoppage commenced there were only thirty-eight blast-furnaces in operation on the North-East Coast, out of a total of one hundred and six available. At the moment there are twenty-three blast-furnaces in operation, but that number is certain to be considerably increased in the near future.

Good Trade Promised.

The conditions at the moment seem favourable to a considerably increased production. A ready market for all that can be produced is apparently assured for at least a few months to come, and thereafter the operation of the sound economic law that low prices stimulate the demand might well be trusted to maintain consumption at the same high level. Low prices and increased output will probably open the door to prosperity once more to the Cleveland iron trade. Cheap fuel, however, is essential, and at the moment there is great anxiety about the ultimate figure at which blast-furnace coke will be established. Any addition to pre-strike values which ranged from about 18s. 6d. to 22s. per ton is not necessarily inevitable, as the loss of the subsidy should be more than offset by longer hours and lower wages in the mines. An active iron trade is vital to the prosperity of the coal trade, and with that clearly recognised, fuel prices promise to be speedily adjusted, so as to permit of the production of Cleveland pig iron on a commercial basis. Business has virtually ceased until after the holidays, which were reduced to a minimum at the steel works, and, of course, the blast-furnaces have worked continuously, so that supplies should be little less restricted when business is resumed. Makers' prices for short-date contracts—which may be shaded for longer periods—are unchanged, No. 1 Cleveland foundry iron being 90s. per ton; No. 3 G.M.B., 87s. 6d.; No. 4 foundry, 86s. 6d.; and No. 4 forge, 85s. 6d.

Manufactured Iron and Steel.

The manufactured iron and steel trade also had a sorry record for 1926. Almost without exception, firms incurred heavy losses, which, coming at the end of a slump of unparalleled duration, have shaken the financial stability of even the strongest. There are, however, good grounds for the belief that an industrial revival has begun which will enable the firms to restore their finances and make some return on the invested capital. The path to recovery is not going to be an easy one. Producers in this area, as in others, are still being undersold by continental competitors, but there is evidence that costs of production on the Continent are on the up grade. Still, a very optimistic view is taken of the outlook. The last two months of 1926 witnessed a remarkable revival of business confidence, and steel makers in particular observed with great satisfaction the rush of orders for new tonnage which gives promise of a busy year for North-East Coast yards. Shipbuilding activity is the touchstone of prosperity for the steel trade. If the shipyards are busy the steel works can never be wholly idle, and the hopes for 1927 are largely founded upon the renewed confidence which has prompted shipowners to place orders so freely. But it is not only in shipbuilding material that demand shows a welcome increase. Consumers are clamouring for all descriptions. Big contracts have been placed covering the whole of next year, and prices, moreover, though still somewhat depressed, show a certain amount of resistance which should at least enable the works to operate at a moderate profit.

The Coal Trade.

The demand for all descriptions of Durham and Northumberland fuel is steadily expanding. Outputs are on a good scale, but operations at the collieries are still seriously inconvenienced as a result of the shortage of wagons. Durham coking fuels are in very brisk demand. Reports state Belgium will require very large quantities during the next three months, and, with buyers freely inquiring, sellers regard the prospects as encouraging, and values have improved about 6d. per ton. Spot supplies are obtainable at recent prices, but for January producers now quote as a minimum 19s., while for favourite grades 20s. is firmly asked, and the undertone points to a further rise. There is no development in the gas coal demand. London requirements are very limited, owing to large quantities of foreign fuel still being available. Best qualities are quoted at 22s. 6d. There is a good general inquiry for steam coals, and the tone for best Northumberlands is steady at 20s. to 20s. 6d. All steam smalls show

a steady and unchanged tone, bests being 13s. 6d. and seconds 12s. 6d. to 13s. The position in the coke trade is easy and supplies are plentiful. Gas coke is 32s. 6d. to 35s.; foundry cokes, 27s. 6d. to 30s.

SCOTLAND.

(From our own Correspondent.)

Clyde Shipbuilding.

FOR obvious reasons the year now closing has been unsatisfactory compared with the preceding twelve months, and compares still more unfavourably with many preceding years. The tonnage launched during 1926 reached a total of 173 vessels of 287,244 tons aggregate, compared with 280 vessels of 523,322 tons aggregate in 1925. This decrease in production is almost entirely the direct result of the coal strike, with its consequent shortage of fuel and materials. The Clyde production of marine engines reached a total of 427,015 indicated horse-power, which is almost similar to that of 1925, but this year's figures include 210,000 indicated horse-power in connection with naval work. The mercantile machinery total has therefore decreased by over 230,000 indicated horse-power. Many contracts have been held up during the past twelve months, and they, in conjunction with the fresh contracts placed since the end of the strike, will mean considerable activity over a period, whenever a sufficient supply of the necessary materials becomes available. While the output is not likely to be abnormal, there seems every reason to anticipate a good year in 1927.

Quiet Markets.

In ordinary times it has been usual at this season to experience a busy time prior to the closure for the New Year holidays, but nothing of the kind is noticeable this year. As a matter of fact, any activity apparent since the close of the coal strike has died down, and the quietening process has been marked during the past two weeks. Stocktaking has begun earlier than usual at many establishments, while at others, of course, energies have been directed towards getting plants into working order in anticipation of better trade in the next few months. Consequently, most markets have been more or less inactive.

Steel and Iron.

A large number of the steel works have remained closed, and will not reopen until fuel is nearer the pre-strike level in price. Some have restarted and others are preparing to follow suit, but business on the whole continues extremely quiet. Makers, as a rule, have a good proportion of work on hand, and are assured of a busy period for some months, whenever production can be commenced on an economic basis. Practically all the bar iron works are in operation. The output of iron is restricted by the price of coal, and chief attention is still directed towards the production of steel bars manufactured from foreign materials.

Steel Sheets.

Makers of black and galvanised sheets provide the exception to the prevailing rule in respect to the activity at the works and orders on hand. An abnormal number of orders have been booked, and inquiries, especially for the lighter gauges, continue to flow in. Heavy grades of galvanised sheets are well sold ahead. Prospects in sheets are particularly bright.

Pig Iron.

The output of pig iron is still confined to two furnaces and supplies therefore are extremely small, and prices remain on a very firm level. A few other furnaces are practically ready to commence operations, and more will be put into commission early in the New Year.

Coal.

The situation in the coal trade has continued more or less without alteration. With fuel slowly declining in price, buying on all hands is of a hand-to-mouth description. Outputs have been restricted at many collieries, through a shortage of wagons, but the production generally has been ample for all requirements. Very few foreign inquiries are reported, but despite the absence of business, nominal quotations show little change, as many collieries are engaged clearing orders held up during the strike and due for shipment before the close of the year. For land sale, screened steam is quoted 22s. 6d. to 25s.; unscreened, 17s. 6d. to 19s.; treble nuts, 24s. to 25s.; doubles, 22s. to 23s.; singles, 17s. 6d. to 19s.; pearls, 13s. 6d. to 15s. 6d.; and dross, 12s. 6d. to 15s.—all per ton f.o.t. at pit. House coal varies between 24s. and 32s. 6d. per ton at pit, according to quality.

WALES AND ADJOINING COUNTIES.

(From our own Correspondent.)

The Coal Outlook.

IT is customary at this time of the year to give a short review of the happenings of the last twelve months, but on this occasion everything has been overshadowed by the coal strike, which lasted for a period of seven months and caused incalculable loss to colliery and allied undertakings in particular and the country in general, crippling Trade Unions and inflicting untold suffering on the working classes. Anticipation of the strike brought about abnormal conditions for a month before the stoppage actually commenced, while even now the process of settling down is in operation, so that it can be said that 1926 is a year that all concerned would prefer to forget than to dwell upon. There is more to be gained by looking forward to the possibilities of trade than by reviewing past troubles, and, although the difficulties of recovering the ground lost are not by any means under-estimated, still there is much to encourage the view that there are prospects of very considerable activity prevailing during the coming year, provided nothing untoward happens in the labour world to check trade again. The coalowners have now got their eight-hour day, which should enable them to secure a larger output at an appreciably lower cost, revised hours of work on the docks for the coal trimmers and tippers have been agreed upon, and to expedite the loading of coals a new scale of loading hours has been framed as between the coalowners, the coal exporters, and the shipowners. It only remains for all parties to pull together, reduce costs generally by doing better work, and when coal prices have found their proper relative values, as compared with the prices of foreign competitors, there is no doubt that South Wales will make considerable headway in all the markets abroad. In one sense the coal stoppage has been a good advertisement for Welsh coals, there being no doubt that inability to secure supplies for such a long period has made many foreign consumers appreciate more than ever their value. It will in all probability be some weeks yet before the conditions in the coal trade become stable. Values are quietly falling, while production is steadily improving. Last week just over 200,000 tons were exported as cargo, which compared with rather more than 95,000 tons during the preceding week. It will be realised, however, that there is much progress yet to be made when it is reflected that in the corresponding week of last year the quantity of coals shipped as cargo amounted to over 400,000 tons.

Coal Contract.

The Egyptian State Railways, which recently called for tenders for 160,000 tons of locomotive coal for delivery at Alexandria during February, March and April are reported to have only purchased 50,000 tons of Welsh coal. The lowest tender was that of Messrs. Gwilym Owen and Co., of London, at 36s. c.i.f. Alexandria.

Steel and Tin-plate Trade.

The South Wales and Monmouthshire Iron and Steelworkers' sliding scale audit for the quarter ended November 30th last was announced last week, and shows a reduction in wages for the three months commencing January 1st next of 2 per cent. in the scale, which will consequently fall at the end of this year from 51 to 49 per cent. above the standard. Quite a number of tin-plate works in South Wales have of late resumed operations now that suitable coals are obtainable in unrestricted supply and at a more reasonable level so far as price is concerned. Last week the records showed that at Llanelly there were 1500 fewer unemployed as compared with the preceding week. At Cardiff it was expected that an additional furnace would be restarted at the Dowlais Works on Wednesday of this week, and it is hoped that before very long work will be available for an additional two hundred men. The conditions in the engineering and ship-repairing line are also decidedly improved, there being more vessels in the hands of the various firms undergoing repairs than has been the case since last April.

The Burden of Relief.

The coal stoppage cast a very heavy burden upon local authorities and Boards of Guardians, and it is quite conceivable that that will cause some considerable trouble in the various industrial areas in the future. At a conference held at Cardiff on Tuesday of Labour members from local authorities in South Wales and Monmouthshire, one speaker said that, taking the South Wales coalfield as a whole, he did not suppose they would be far out if they assumed that at least £2,500,000 had been spent in special relief during and since the coal stoppage commenced. The conference passed a resolution instructing Labour members of Boards of Guardians to resist any attempt to put into operation the provisions of the 1834 Act, by means of which Boards of Guardians might proceed to obtain orders for repayment from those who had obtained outdoor relief by deductions from wages.

Pipe Line Contract.

Representatives of Guest, Keen and Piggott's, Ltd., met the Cardiff Corporation Waterworks Committee last week with reference to their contract for the supply to the Corporation of cement lined and steel pipes for the No. 2 section of the new pipe line extending from Abercynon to Llanishen. They pointed out that owing to unforeseen circumstances the work was costing them very much more than was anticipated. They requested the Committee favourably to consider an application for an additional allowance of £10,000 in respect of the contract. The Committee instructed the city treasurer to report fully on the question of the differential labour costs between Cardiff and Birmingham, the additional fuel costs owing to the mining dispute and the whole matter generally.

Current Business.

Operations in coals for export have been interrupted by the holidays, and it will be next week before business really settles down. There are inquiries on the market, but it cannot be said that there is any great demand as yet. Foreign consumers who are disposed to purchase cargoes for delivery over either six or twelve months are quoting prices much reduced as compared with the present f.o.b. values of coals, and consequently the offers do not appear to be very attractive to sellers. At the same time it is scarcely likely that there will be a very material volume of business at the existing high level of quotations. Buyers are certain to defer as long as possible their purchases, and only go on a hand-to-mouth principle. Nominally there is very little alteration in prices as compared with a week ago, though the tone of the market is barely steady except in the case of a few qualities such as smithy coals and sized qualities for the reason that at the moment the production is so far below the normal. Patent fuel works are as yet by no means in full swing, the pitch question being one which causes manufacturers some concern. Although this commodity has fallen in the past week or two from between £10 to £11 down to about £6 10s. per ton the figure is still three to four times as high as in 1913, and for every ton of fuel manufactured it takes 10 per cent. of pitch. The pitwood market is quiet on the basis of 35s. to 36s. per ton.

CALENDARS, DIARIES, &c.

ASSOCIATED BRITISH MACHINE TOOL MAKERS, Ltd., 17, Grosvenor-gardens, S.W. 1.—Wall calendar with monthly tear-off sheets.

ATLANTIC TRANSPORT LINE, 38, Leadenhall-street, E.C. 3.—Wall calendar with monthly tear-off sheets.

A. BORSIG, Tegel.—Desk diary with tear-off sheets.

BRAITHWAITE AND CO. (ENGINEERS), Ltd., Broadway Buildings, Broadway, S.W. 1.—Pocket diary for 1927.

BRISTOL AEROPLANE COMPANY, Ltd., Filton, Bristol.—Desk memorandum tablet with calendar for the year.

BRITISH BROWN-BOVERI, Ltd., London.—Wall calendar with monthly tear-off sheets.

E. BROOK, Ltd., Empress Works, Huddersfield.—Pocket diary for 1927.

WILLIAM COLLINS, SONS AND CO., Ltd., Herriot Hill Works, Glasgow.—Copy of Collins' "Engineer's Diary, 1927," No. 399.

J. E. DODSWORTH, 25, Brockwell Park-gardens, S.E. 24.—Copy of pocket diary for engineers, published by Charles Letts and Co., S.E. 1.

"THE DRAUGHTSMAN," 96, St. George's-square, S.W. 1.—Pocket diary for 1927.

ALEXANDER DUTHIE AND CO., 58, West Regent-street, Glasgow.—Treasury note case.

ENGINEERING AND COMMERCIAL COPYING COMPANY, 137, Victoria-street, S.W. 1.—Wall calendar with monthly tear-off sheets.

EVERSHED AND VIGNOLES, Ltd., Acton-lane Works, Chiswick, W. 4.—Wall calendar with monthly tear-off sheets.

FOAMITE FIREFOAM, Ltd., 24–26, Maddox-street, W. 1.—Wall calendar with monthly tear-off sheets.

GEAR GRINDING COMPANY, Ltd., Handsworth, Birmingham.—Wall calendar with monthly tear-off sheets.

GENERAL ELECTRIC COMPANY, Ltd., Magnet House, Kingsway, W.C. 2.—Refills daily reminder desk calendar.

HART ACCUMULATOR COMPANY, Ltd., Marshgate-lane, Stratford, E. 15.—Desk blotter and wall calendar.

ALFRED HERBERT, Ltd., Coventry.—Copy of 1927 production calendar with monthly tear-off sheets.

HOFFMANN MANUFACTURING COMPANY, Ltd., Chelmsford, Essex.—Wall calendar with daily tear-off sheets.

HOLMAN BROS., Ltd., Camborne, Cornwall.—Wall calendar with monthly tear-off sheets.

HULSE AND CO., Ltd., Ordsal Works, Manchester.—Wall calendar with monthly tear-off sheets.

IRONITE COMPANY, Ltd., 11, Old Queen-street, Westminster.—Wall calendar with monthly tear-off sheets.

LAW LAND BUILDING DEPARTMENT, Ltd., 30, Norfolk-street, Strand, W.C. 2.—Pocket diary for 1927.

MARSHALL, SONS AND CO., Ltd., Gainsborough.—Wall calendar with monthly tear-off sheets.

METCHIM AND SON, 8, Princes-street, Westminster, S.W. 1.—Copy of "The Surveyors' Tables and Diary, 1927."

C. A. PARSONS AND CO., Ltd., Heaton Works, Newcastle-on-Tyne.—Wall calendar with monthly cards.

A. C. POTTER AND CO., Grantham.—Pocket diary for 1927.

RICHARD JOHNSON, CLAPHAM AND MORRIS, Ltd., Manchester.—Desk calendar with monthly tear-off sheets.

REASON MANUFACTURING COMPANY, Ltd., Brighton.—Tobacco pouch.

JOHN ROGERSON AND CO., Ltd., Wolsingham S.O., Co. Durham.—Wall calendar with monthly tear-off sheets.

RONEO, Ltd., Holborn, E.C. 1.—A copy of "Roneo" indexed diary for 1927.

RUSTON AND HORNSBY, Ltd., Lincoln.—Wall calendar with monthly tear-off sheets.

SENTINEL WAGGON WORKS, Ltd., London and Shrewsbury.—Wall calendar with monthly cards.

"SHEFFIELD DAILY TELEGRAPH," Sheffield.—Calendar with monthly tear-off slips.

SIMPLEX CONDUITS, Ltd., Garrison-lane, Birmingham.—"Simplex" pocket diary for 1927.

HENRY SIMON, Ltd., 20, Mount-street, Manchester.—Desk calendar with daily tear-off sheets.

STAVELEY COAL AND IRON COMPANY, Ltd., near Chesterfield.—Pocket diary for 1927.

SUPERHEATER COMPANY, Ltd., 195, Strand, W.C. 2.—Wall calendar with weekly tear-off sheets.

J. I. THORNYCROFT AND CO., Ltd., Thornycroft House, S.W. 1.—Leather pocket wallet.

VICKERS LTD., Vickers House, S.W. 1.—Pocket diary for 1927.

WAILES DOVE BITUMASTIC, Ltd., 5, St. Nicholas-buildings, Newcastle-on-Tyne.—Pocket diary for 1927.

WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY, 2 and 3, Norfolk-street, Strand, W.C. 2.—Pocket diary for 1927 and greetings card.

EDWARD WOOD AND CO., Ltd., Ocean Ironworks, Trafford Park, Manchester.—Pocket diary for 1927 and wall calendar with monthly tear-off sheets.

CONTRACTS.

HENRY SIMON, Ltd., of Manchester, has received from the Port of Santos (Brazil) Dock Company an order for the erection and equipment of a complete new granary and the installation of pneumatic and mechanical handling plant. The granary will be a reinforced concrete building capable of holding 12,000 tons of wheat, and will be equipped with mechanical conveyors, elevators, automatic weighers, &c., and a complete dust collecting system. The arrangements will be such that delivery can be made to railway wagons either in bulk or in sack as required. Grain vessels arriving at the Port will be discharged by means of two "Simon" pneumatic plants, each having a capacity of 120 tons per hour, and arranged on towers which can be traversed along the quay. The wheat discharged by these plants will be transported on band conveyors arranged in subways below the quay to the granary where they will deliver to intake elevators. The contract also includes the whole of the power plant for driving both the intake equipment and the granary machinery.

Current Prices for Metals and Fuels.

IRON ORE.

N.W. COAST—	
Native	18/6 to 21/-
(1) Spanish	18/6 to 21/-
(1) N. African	18/6 to 21/-
N.E. COAST—	
Native	18/- to 21/-
Foreign (c.i.f.)	18/- to 21/-

PIG IRON.

	Home. £ s. d.	Export. £ s. d.
(2) SCOTLAND—		
Hematite	—	—
No. 1 Foundry	‡4 17 6 to 5 0 0	—
No. 3 Foundry	‡4 12 6 to 4 15 0	—

‡ *For delivery after resumption of work at furnaces.*

N.E. COAST—		
Hematite Mixed Nos.	c4 10 0	4 10 0
No. 1	c4 11 0	4 11 0
Cleveland—		
No. 1	c4 7 6	4 7 6
Siliceous Iron	c4 7 6	4 7 6
No. 3 G.M.B.	c4 5 0	4 5 0
No. 4 Foundry	c4 4 0	4 4 0
No. 4 Forge	c4 3 0	4 3 0
Mottled	c4 2 0	4 2 0
White	c4 2 0	4 2 0

(c) *January - February Delivery.*

MIDLANDS—		
(3) Staffs.—		
All-mine (Cold Blast)	10 10 0	—
North Staffs. Forge	3 17 6	—
„ „ Foundry	4 7 6	—
(3) Northampton—		
Foundry No. 3	4 0 0 to 4 2 6	
„ Forge	—	—
(3) Derbyshire—		
No. 3 Foundry	4 5 0	—
Forge	—	—
(3) Lincolnshire—		
No. 3 Foundry	4 5 0	—
No. 4 Forge	—	—
Basic	—	—
(4) N.W. COAST—		
N. Lancs. and Cum.—		
Hematite Mixed Nos.	4 15 6 (a); 4 18 6 (b); 5 2 0 (c)	—

MANUFACTURED IRON.

	Home. £ s. d.	Export. £ s. d.
SCOTLAND—		
Crown Bars	12 0 0	11 15 0
Best	—	—
N.E. COAST—		
Common Bars	12 5 0	—
LANCS.—		
Crown Bars	12 10 0	—
Second Quality Bars	11 5 0	—
Hoops	14 0 0	—
S. YORKS.—		
Crown Bars	12 10 0	—
Best Bars	13 10 0	—
Hoops	14 10 0	—
MIDLANDS—		
Crown Bars	12 15 0	—
Marked Bars (Staffs.)	14 10 0	—
Nut and Bolt Bars	11 5 0 to 11 10 0	
Gas Tube Strip	15 0 0	—

STEEL.

	(6) Home. £ s. d.	(7) Export. £ s. d.
(5) SCOTLAND—		
Boiler Plates	11 0 0	—
Ship Plates, ¾in. and up d	8 2 6	7 0 0
Sections	7 17 6 to 8 0 0	6 5 0
Steel Sheets, under 3/16in. to ¼in.	12 0 0 to 13 0 0	
Sheets (Gal. Cor. 24 B.G.)	—	£16 10 0 to 17 10 0

(d) *Official Minimum, actual prices about 5s. more.*

STEEL (*continued*).

N.E. COAST—	Home. £ s. d.	Export. £ s. d.
Ship Plates	8 17 6	—
Angles	8 12 6	—
Boiler Plates	12 10 0	—
Joists	8 12 6	—
Heavy Rails	8 10 0	—
Fish-plates	12 0 0	—
Channels	10 5 0	£9 to £9 5
Hard Billets	8 12 6	—
Soft Billets	7 12 6	—
N.W. COAST—		
BARROW—		
Heavy Rails	8 10 0†	—
Light Rails	8 15 0 to 9 0 0	
Billets	8 0 0 to 11 10 0†	
MANCHESTER—		
Bars (Round)	9 0 0	—
„ (Small Round)	9 7 6	—
Hoops (Baling)	11 0 0	11 0 0
„ (Soft Steel)	10 15 0	10 15 0
Plates	8 15 0 to 9 0 0	
„ (Lancs. Boiler)	11 15 0	—
SHEFFIELD—		
Siemens Acid Billets	11 0 0	—
Bessemer Billets	11 0 0	—
Hard Basic	9 2 6	—
Intermediate Basic	8 12 6	—
Soft Basic	8 0 0	—
Hoops	12 0 0	—
Soft Wire Rods	10 0 0	—
MIDLANDS—		
Small Rolled Bars	8 15 0 to 9 0 0	
Billets and Sheet Bars	—	
Sheets (20 W.G.)	11 10 0 to 12 0 0	
Galv. Sheets, f.o.b. L'pool	16 5 0	—
Angles	8 12 6 to 8 17 6	
Joists	8 12 6 to 8 17 6	
Tees	9 12 6 to 10 17 6	
Bridge and Tank Plates	—	
Boiler Plates	—	

NON-FERROUS METALS.

SWANSEA—	
Tin-plates, I.C., 20 by 14	20/6 to 21/6
Block Tin (cash)	307 0 0
„ (three months)	298 0 0
Copper (cash)	57 0 0
„ (three months)	57 15 0
Spanish Lead (cash)	29 3 9
„ (three months)	29 11 3
Spelter (cash)	32 17 6
„ (three months)	32 17 6
MANCHESTER—	
Copper, Best Selected Ingots	64 0 0
„ Electrolytic	64 7 6
„ Strong Sheets	92 0 0
„ Tubes (Basis Price) lb.	0 1 1
Brass Tubes (Basis Price) lb.	0 1 0
„ Condenser lb.	0 1 2½
Lead, English	30 12 6
„ Foreign	29 2 6
Spelter	32 17 6
Aluminium (per ton)	£107

FERRO ALLOYS.

(*All prices now nominal.*)

	Per Ton.	Per Unit.
Tungsten Metal Powder	1/10 per lb.	
Ferro Tungsten	1/6 per lb.	
Ferro Chrome, 4 p.c. to 6 p.c. carbon	£23 0 0	7/6
„ „ 6 p.c. to 8 p.c. „	£22 0 0	7/3
„ „ 8 p.c. to 10 p.c. „	£20 12 6	6/6
„ „ Specially Refined		
„ „ Max. 2 p.c. carbon	£36 0 0	12/6
„ „ „ 1 p.c. „	£42 0 0	15/-
„ „ „ 0·70 p.c. carbon	£54 0 0	17/6
„ „ „ carbon free	1/5d. per lb.	
Metallic Chromium	3/- per lb.	
Ferro Manganese (per ton)	£16 for home, £16 for export scale 5/- per unit	
„ Silicon, 45 p.c. to 50 p.c.	£11 7 6	
„ „ „ 75 p.c.	£18 5 0 scale 6/- per unit	
„ Vanadium	14/6 per lb.	
„ Molybdenum	5/- per lb.	
„ Titanium (carbon free)	0/11½ per lb.	
Nickel (per ton)	£170	
Cobalt	8/3 per lb.	

FUELS.

SCOTLAND.

(*Prices not stable*).

LANARKSHIRE—	Export.
(f.o.b. Glasgow)—Steam	—
„ „ Ell	—
„ „ Splint	—
„ „ Trebles	—
„ „ Doubles	—
„ „ Singles	—
AYRSHIRE—	
(f.o.b. Ports)—Steam	—
„ „ Jewel	—
„ „ Trebles	—
FIFESHIRE—	
(f.o.b. Methil or Burntisland)—Steam	—
Screened Navigation	—
Trebles	—
Doubles	—
Singles	—
LOTHIANS—	
(f.o.b. Leith)—Best Steam	21/6
Secondary Steam	19/-
Trebles	25/-
Doubles	22/6
Singles	20/-

ENGLAND.

(8) N.W. COAST—	
Steams	28/-
Household	*No quotation*
Coke	33/-
NORTHUMBERLAND—	
Best Steams	21/- to 23/-
Second Steams	19/-
Steam Smalls	14/-
Unscreened	18/-
Household	30/- to 36/-
DURHAM—	
Best Gas	22/-
Second	19/- to 20/-
Household	30/- to 36/-
Foundry Coke	30/-
SHEFFIELD—	Inland.
Best Hand-picked Branch	34/- to 35/- —
Barnsley Best Silkstone	30/- to 32/- —
Derbyshire Best Brights	30/- to 32/- —
„ „ House	28/- to 30/- —
„ „ Large Nuts	27/- to 29/- —
„ „ Small	22/- to 24/- —
Yorkshire Hards	20/- to 21/- —
Derbyshire Hards	20/- to 21/- -
Rough Slacks	11/- to 12/6 —
Nutty Slacks	10/- to 11/- —
Smalls	3/- to 6/- —
Blast-furnace Coke (Inland)	30/- to 35/- at ovens.
„ „ (Export)	f.o.b. 30/-

(9) SOUTH WALES.

CARDIFF—	
Steam Coals :	
Best Smokeless Large	28/- to 29/-
Second „ „	27/- to 28/-
Best Dry Large	27/6 to 28/-
Ordinary Dry Large	26/- to 27/-
Best Black Vein Large	27/- to 28/-
Western Valley Large	26/6 to 27/6
Best Eastern Valley Large	26/6 to 27/6
Ordinary „ „	25/- to 26/-
Best Steam Smalls	19/- to 20/-
Ordinary „	14/- to 18/-
Washed Nuts	30/- to 32/6
No. 3 Rhondda Large	32/6 to 33/6
„ „ Smalls	25/- to 26/-
No. 2 „ Large	27/6 to 28/-
„ „ Through	24/- to 25/-
„ „ Smalls	18/- to 19/-
Foundry Coke (export)	45/- to 52/6
Furnace Coke (export)	40/- to 45/-
Patent Fuel	30/- to 35/-
Pitwood (ex ship)	35/- to 36/-
SWANSEA—	
Anthracite Coals :	
Best Big Vein Large	47/6 to 50/-
Seconds	42/6 to 45/-
Red Vein	37/6 to 39/6
Machine-made Cobbles	55/- to 57/6
Nuts	60/- to 65/-
Beans	50/- to 52/6
Peas	29/- to 30/-
Breaker Duff	12/- to 12/6
Rubbly Culm	16/- to 17/-
Steam Coals :	
Large	27/6 to 32/6
Seconds	25/- to 27/6
Smalls	14/- to 16/-
Cargo Through	21/6 to 24/-

(1) Delivered. (2) Net Makers' works. (3) f.o.t. Makers' works, approximate. (4) Delivered Sheffield. (5) Glasgow, Lanarkshire and Ayreshire.

(6) Home Prices—All delivered Glasgow Station. Boiler Plates 10/- extra delivered England. (7) Export Prices—f.o.b. Glasgow. (8) Except where otherwise indicated, coals are per ton at pit for inland and f.o.b. for export, and coke is per ton on rail at ovens and f.o.b. for export. (9) Per ton f.o.b. † Latest quotations available.

(a) Delivered Glasgow. (b) Delivered Sheffield. (c) Delivered Birmingham.

French Engineering Notes.

(From our Correspondent in Paris.)

Stabilisation.

THE fact of the franc having attained some degree of stabilisation during the week has not changed the situation of the iron, steel and engineering industries, for no one has the remotest idea of what will happen in the immediate future, and any further acceleration of monetary improvement would be worse, temporarily, than another deflation. So long as all economic activity is arrested by the failure of production costs to fall into line with the higher purchasing power of the franc, there is bound to be a continuance of the industrial crisis which must accentuate. The fear of trouble ahead is observable in the haste with which the Government is pushing forward its scheme of public works in order that it may be introduced into the Chamber of Deputies as soon as possible. At the same time it is sought to show that the unemployment crisis is not as serious as is represented. Unfortunately, it is impossible to deny the existence of the crisis. There is a good deal of unemployment, and it would be still greater if employers were not keeping as many hands on as possible by working short time in the hope that an early improvement will avoid the necessity of discharging a considerable number of men. Already, in view of the natural preference shown in times like the present for French workmen instead of foreigners, many of these latter are leaving the country, and this fact has the effect of making the situation easier for the moment. Anxiety for the future is general, but it is relieved by the hope that the policy adopted by the Government will revive confidence. Meanwhile, business is at a standstill, because no one will buy when they believe that prices are too high. Prices cannot be reduced except by a diminution in the cost of coal and coke and by a lowering of wages. It is reported, although as yet unconfirmed, that the rail makers had to refuse orders for 60,000 tons of rails which had been allotted to them from the London headquarters of the Rail Union, because the price was too low and that consequently the work went to Germany. The annual reports of some of the engineering companies, especially those supplying railway material, state that the situation has become very serious, one firm declaring that the crisis is more severe than any yet experienced.

Railway Electrification.

The electrified railway between Paris and Vierzon was officially put into service last week. It marks the first stage of the total electrification of the Paris–Orleans system which will be continued by an extension of the line from Vierzon to Brive, with transverse lines from Brive to Clermont and from Saint-Sulpice to Gannat. Including sidings, the total length of the four electrified tracks between Paris and Vierzon is about 560 miles, and it is declared that the railway will carry a heavier traffic than any other electric system over a similar distance. The official train was drawn by one of the 4000 horse-power locomotives, and the journeys both ways were made well up to the commercial speed limit of 75 miles an hour. Energy is supplied by the Gennevilliers Power Station in conjunction with the Eguzon hydro-electric plants in the Indre. It will be supplemented in the coming year by the hydro-electric installation at Coindre on the Upper Dordogne, while another station at Marèges, on the Upper Dordogne, will furnish the energy required for the extension of the electrified system to Brive. In addition to eighty motor vehicles employed mainly for the Paris suburban traffic, the equipment consists of 200 locomotives of from 1420 to 1720 horse-power, and five locomotives of from 3000 to 4400 horse-power, these latter being capable of attaining a speed of 80 miles an hour. The current from Gennevilliers and Eguzon is transformed at Chevilly, near Paris, and at Chaigny, near Orleans, to 90,000 volts and then at eleven sub-stations to 1500 volts for the working of the line. It is declared that the electrification of the Paris–Vierzon line will represent an economy of a quarter of a million tons of coal a year. Railway electrification is only regarded as economical in cases in which, like the Midi, the current is supplied entirely by hydro-electric installations, and the cost of coal is high, or where steam generators are used in conjunction with hydro-electric plants, this latter combination being preferred as suppressing risk of failure of the hydraulic system in times when there may be an insufficient head of water. It may be remarked that there is no intention to electrify all the railways in this country, for strategical considerations will always render it necessary to employ steam locomotives on railways serving the frontiers.

Works in Paris.

The amount to be spent upon the carrying out of public works in Paris during the coming year will be a little more than 38 million francs. Much of this sum will be devoted to the repaving of roads, the construction of buildings, and the lending of money to landlords to enable them to carry out the sanitary improvements required under the new by-laws. The Morland and Concorde Bridges are to be widened. Meanwhile, the levelling of the fortifications is being proceded with, and while a large part of the land which will be made available will be laid out in open spaces, the remainder will be sold for building purposes, so as to provide revenue to pay for the cost incurred in carrying out this important work. The disappearance of the fortifications will be followed by the preparation of a vast scheme for connecting Paris up with the suburbs on a definite plan, with adequate means of communication, so as to facilitate the decongestion of the over-populated city.

Harbour Works.

Notwithstanding the difficulty of carrying out the work of constructing the port of Casablanca, where all the material, except the stone obtained from neighbouring quarries, has to be imported from France, the two great breakwaters, one 2080 m. and the other 1485 m. long, have been completed, providing a harbour 500 acres in extent with a depth at the entrance of 12·5 m.

British Patent Specifications.

When an invention is communicated from abroad the name and address of the communicator are printed in italics.

When an abridgment is not illustrated the Specification is without drawings.

Copies of Specifications may be obtained at the Patent Office, Sale Branch, 25, Southampton-buildings, Chancery-lane, W.C., at 1s. each.

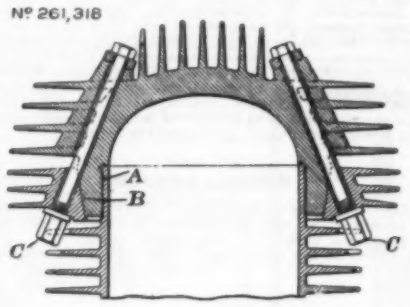
The date first given is the date of application; the second date, at the end of the abridgment, is the date of the acceptance of the complete Specification.

INTERNAL COMBUSTION ENGINES.

261,318. September 3rd, 1926.—AIR-COOLED CYLINDER HEADS, D. Napier and Sons, Ltd., 211, Acton-vale, London, W. 3, and R. Hutchinson, 9, Friars-gardens, Acton.

The object of this invention is to maintain a tight joint between the cylinder and its head when the two are made of dissimilar metals. The head is screwed on to a thread A, cut on the cylinder

Nº 261,318



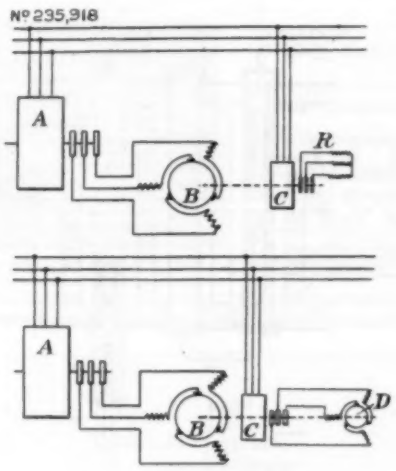
barrel, and outside the threaded part there is a conical ring B of the same metal as the cylinder. The bolts C C are used to pull the ring up into place and compress the two threaded parts together. When the whole assembly is heated, in service, the bosses through which the bolts are threaded expand longitudinally more than the bolts and tend to pull up the ring still more tightly.—*November 18th*, 1926.

DYNAMOS AND MOTORS.

235,918. June 22nd, 1925.—IMPROVEMENTS IN AND RELATING TO SLIP REGULATORS FOR INDUCTION MOTORS, *The British Thomson-Houston Company, Ltd., of Crown House, Aldwych, London, W.C. 2.*

The object of this invention is to improve the slip characteristics of an induction motor mounted in cascade with a series characteristic commutator motor. A represents an induction motor, the speed of which it is desired shall fall more quickly than usual with increase of load. A series characteristic commutator machine B is supplied with the slip energy of the machine A and is mechanically coupled with an induction generator C having resistances R in its secondary circuit, and of such a characteristic that its speed increases appreciably when the

Nº 235,918

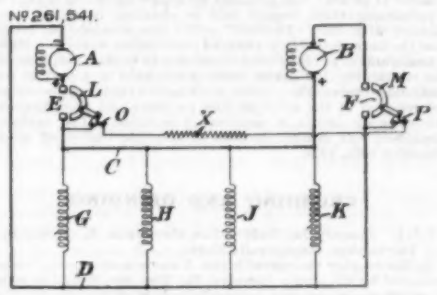


torque of machine B increases. The induction machine C transfers the slip energy of machine A back to the supply main. Since the machine C acts as a generator, the resistance R will cause the speed of the slip group B—C to increase when the load on the motor A increases. The desired variation of the speed of the slip group could also be obtained by means of a small commutator machine inserted in the secondary circuit of the asynchronous generator C. Such an arrangement is indicated in the lower diagram, where the machine D replaces the resistances R. The machine D must have the same characteristics as the resistances R; that is, a voltage increasing with the load; in other words, it, also, is a machine with series characteristics. The theory of the scheme is described.—*November 22nd*, 1926.

261,541. December 3rd, 1925.—IMPROVEMENTS CONNECTED WITH THE EXCITATION OF DYNAMO-ELECTRIC MACHINES, The English Electric Company, Ltd., of Queen's House, 28, Kingsway, London, W.C. 2; and Robert Alexander Raveau Bolton, of, 60, Ranelagh-gardens, Barnes, London, S.W. 13.

Two electric generators A and B are connected in parallel to bus-bars C and D through the overload cut-out switches E and F. The inductive field windings G, H, J, and K of four alternators are supplied with exciting current from the bus-bars C and D, to which they are all connected in parallel. Each of the moving switch members L and M is associated with a subsidiary switch O P in such a way that each switch O P remains open until just before its associated member L and M reaches, during its opening movement, its open from its closed position. At that moment the subsidiary switch O P is closed and remains closed until its associated member has moved back again to its closed position. A discharge resistance X is connected in series with the switches O P across the bus-bars C and D, and it is clear that this resistance will be connected in parallel with the inductive field windings G, H, J, and K as soon as both the switches O and P have closed, which happens just before the last of two switches E and F to open has actually interrupted its circuit. If a switch is connected in circuit with each of the inductive windings G, H, J, and K for the purpose of cutting them out one at a

Nº 261,541.



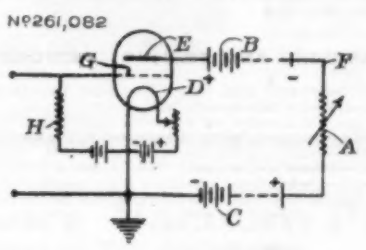
time, it will be desirable to associate each of these switches with a discharge resistance and subsidiary switch operated in substantially the same way as that described. The object of connecting a discharge resistance across a highly inductive load before breaking the circuit is, of course, well known.—*November 25th*, 1926.

TELEGRAPHS AND TELEPHONES.

261,082. August 11th, 1925.—IMPROVEMENTS IN THERMIONIC AMPLIFIERS, Telegraph Construction and Maintenance Company, Ltd., of 38, Old Broad-street, London, E.C. 2, and Harry Conway Redgrave, of "Oakcroft," Sidcup Hill, Kent.

This invention relates to thermionic amplifiers and more particularly to amplifiers suitable for use as magnifiers of small electrical impulses, such as are received at the receiving end of a telegraph system or a submarine cable or the like. The amplifying stage comprises a "square" network, of which one side is the anode-cathode resistance of a thermionic three-electrode valve. The side opposite thereto is a variable resistance A and the remaining two sides are anode and balancing batteries B and C. The four sides of this network are in series with one another, so that there is a closed circuit extending from the cathode D to the anode E of the valve, then through the anode battery B, from positive to negative thereof, through the resistance A, through the balancing battery C from positive to negative, and back to the cathode D. With this arrangement the potential difference between the cathode D and the corner F of the network depends upon the values of the anode and balanc-

Nº 261,082



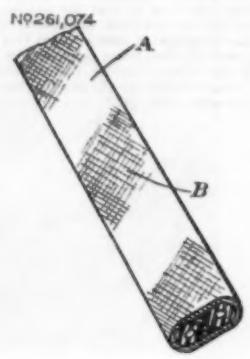
ing batteries B C and of the resistances A and that formed by the anode-cathode space of the valve. By suitably adjusting these values, the potential of the point F may be maintained at any desired constant value, and the potential difference between this point and the cathode D may then be varied by varying the anode-cathode resistance of the valve. The impulses to be amplified are applied between the grid G and cathode of the valve, across a resistance or impedance H. The impulses to be amplified cause the anode-cathode resistance to vary, and thereby give rise to magnified changes of potential between the cathode and the point F of the network. These amplified potential changes may be applied to a recorder, or—in the case of an amplifier employing two or more valves in cascade—between the grid and cathode of the next thermionic valve. Since the point F of the network can be adjusted to a suitable potential, the point may be directly connected to the recorder or to the grid of the next valve, as the case may be, thus obviating the use of condensers or transformers, and the amplifier may be thereby rendered substantially independent of the frequency of the impulses, except for such dependence as may be due to stray capacities. A scheme for two stages of amplification is also illustrated and described.—*November 11th*, 1926.

TRANSMISSION OF POWER.

261,074. August 10th, 1925.—IMPROVEMENTS IN ELECTRIC CABLES, Callender's Cable and Construction Company, Ltd., of Anchor Works, Leigh, Lancaster, and Stanley James Bryce, of the same address.

According to this invention, an insulated and sheathed electric

Nº 261,074.



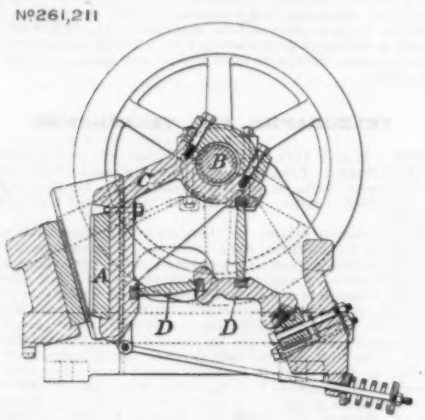
cable is coated with a metal, such as copper or silver and the surface so produced is lacquered or is "oxidised" and lacquered. Thus a cable sheathed with lead or lead alloy may be coated with a thin layer of copper, which layer is then wholly or in part "oxidised," *e.g.*, by treatment with a soluble sulphide. The

term "oxidised" is used generically to include processes of oxidising, sulphidising, &c., in which the whole or part of the outer layer is modified by a superficial treatment which renders the surface chemically more inert towards atmospheric influence. By way of example, a length of lead-sheathed cable is cleaned by scratch brushing, then washed, immersed in copper solution, such, for instance, as a bath of copper sulphate (1 lb.), dissolved in water (1 gallon), and acidified with pure sulphuric acid (1 lb.). A sufficiently thick deposit will be obtained in about 5 to 10 minutes with one "Daniell" cell. Immediately on removal from the bath the cable is plunged into boiling water and allowed to drain and dry. It is then immersed in barium sulphide solution containing 100 grains barium sulphide to 1 pint of water used cold—60 deg. Fah. After washing the cable may be polished and relieved of the sulphide film in parts and then lacquered. The drawing shows a portion of a cable. The surface is "oxidised" at B and the film of sulphide buffed off at A.—*November 10th*, 1926.

CRUSHING AND GRINDING.

261,211. January 1st, 1926.—JAW CRUSHERS, E. O. Stubbings, The Grange, Sandycroft, Flints.

In this crusher the movable jaw A has a compound movement, produced by the single excentric B. The jaw, it will be seen, is mounted on the excentric strap by means of the arm C. There

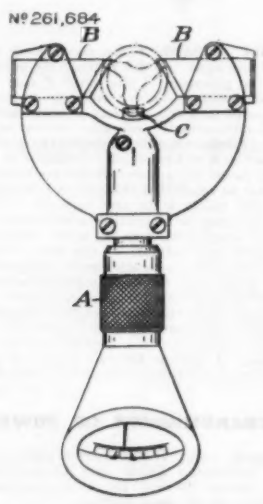


is a toggle system D D, also operated by the excentric. The result is a downward and forward movement of the jaw, at each stroke, which provides a very effective crushing action.—*November 18th*, 1926.

MEASURING AND TESTING INSTRUMENTS.

261,684. September 17th, 1926.—EXTERNAL THREAD GAUGES, Fried. Krupp Aktiengesellschaft, Essen, Germany.

This gauge is intended for measuring the diameters of three-lipped taps or tapping drills. It comprises a micrometer A with a fork-like extension, which carries two anvils B B. The plunger of the micrometer is shown at C. When a drill is to be tested, it is turned first before being introduced in the mouth of the gauge, so that its grooves are opposite the anvils B B and the measuring

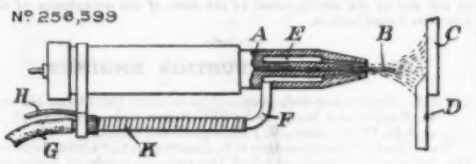


bolt C. The drill is then introduced in the gauge and turned against the cutting direction, so that the testing elements touch the thread of the drill at the flank diameter. During the testing operation the micrometer hangs down from the gauge, a uniform testing pressure thus being permanently secured by the weight of the gauge alone. Before the testing operation the gauge has to be adjusted through the intermediary of a standard thread plug.—*November 25th*, 1926.

WELDING.

256,599. July 24th, 1926.—IMPROVEMENTS IN AND RELATING TO APPARATUS FOR ELECTRIC WELDING, *The British Thomson-Houston Company, Ltd., of Crown House, Aldwych, London, W.C. 2.*

This invention relates to electric arc welding apparatus, adapted to produce a weld between metal parts in a gaseous mixture, and has for its principal object the provision of means for reducing the amount of gas required to produce a strong and ductile weld by means of such apparatus. Another object is to provide a simple and effective means for preheating a gas or vapour in electric welding of this kind. The apparatus com-

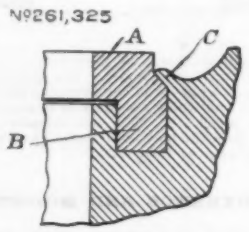


prises an electric discharge nozzle A, through which a fusible welding electrode B may be fed by any suitable means at a rate dependent upon its consumption. The weld is produced by an arc between the electrode and the work shown as plates C and D. The discharge nozzle A contains an annular chamber E, which is adapted to be connected to a source of hydrogen or other suitable gas through a pipe F and flexible tube G for ensuring that a ductile weld is produced between the parts C and D. The pipe F is provided with a heating coil K adapted to be connected through leads H to a source of current for preheating the gas to increase its volume.—*November 18th*, 1926.

MISCELLANEOUS.

261,325. September 14th, 1926.—VALVE SEATINGS, R. A. Blakeborough and A. Hopkinson, Woodhouse Works, Brighouse, Yorks.

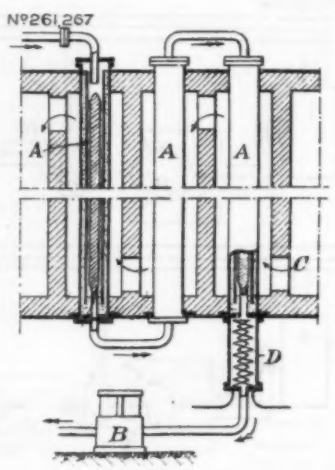
According to this invention the valve seating A is provided



with a flange B, which is pressed into a slightly restricted groove in the main casting. The lip C is then turned over to secure the seating.—*November 18th*, 1926.

261,267. April 29th, 1926.—CONVERSION OF METHANE GAS INTO HYDROCARBONS OF HIGHER CARBON CONTENT, La Petrole Synthetique Société Anonyme, 165, Quai d'Asnières, Asnières (Seine), France, and A. Folliet, Villa la Terrasse, Lozère (Seine et Oise), France.

This invention is concerned with the utilisation of natural gas containing considerable proportions of methane, in the synthetic production of alcohol and other liquid hydrocarbons. The three essential features of the process are—the gradual heating of the



methane gas in a thin film about 1 mm. thick up to a temperature of some 950 deg. Cent.; its maintenance under a partial vacuum of about 20 cm. mercury; and its sudden cooling after treatment. In these circumstances, it is said, undesired compounds are not produced. In the illustration, A, A, A, are the annular chambers through which the thin stream of gas is sucked by the pump B, while it is heated by the products of combustion from the furnace C. D is the apparatus for suddenly cooling the hot gas.—*November 18th*, 1926.

END OF VOL. CXLII.

Forthcoming Engagements.

Secretaries of Institutions, Societies, &c., desirous of having notices of meetings inserted in this column, are requested to note that, in order to make sure of its insertion, the necessary information should reach this office on, or before, the morning of the Wednesday of the week preceding the meetings. In all cases the TIME *and* PLACE *at which the meeting is to be held should be clearly stated.*

TO-DAY.

JUNIOR INSTITUTION OF ENGINEERS.—39, Victoria street, London, S.W. 1. Questions and general technical and practical discussions. 7.30 p.m.

1927.

MONDAY, JANUARY 3RD.

INSTITUTION OF AUTOMOBILE ENGINEERS: WESTERN CENTRE.—Merchant Venturers' Technical College, Bristol. Paper, "The Optical Indicator as a Means of Examining Combustion in Internal Combustion Engines," by Professor W. Morgan. 6.45 p.m.

TUESDAY, JANUARY 4TH.

INSTITUTION OF AUTOMOBILE ENGINEERS.—Royal Society of Arts, John-street, Adelphi, London, W.C. 2. Paper, "The Place of the Tractor in Soil Cultivation," by Dr. B. A. Keen. 7 p.m.

INSTITUTION OF AUTOMOBILE ENGINEERS.—Broadgate Café, Coventry. Coventry Graduates' meeting. Paper, "Recent Developments in Motor Cycle Engine Design," by Mr. W. N. Haynes. 7.15 p.m.

TUESDAY TO THURSDAY, JANUARY 4TH TO 6TH.

PHYSICAL AND OPTICAL SOCIETIES.—Imperial College of Science and Technology, South Kensington, London, S.W. 7. Seventh annual exhibition of electrical, optical and other physical apparatus.

WEDNESDAY, JANUARY 5TH.

INSTITUTION OF ELECTRICAL ENGINEERS.—Savoy-place, Victoria Embankment, London, W.C. 2. Wireless Section meeting. Informal discussion on "The Acoustic Problems of Microphones and Loud-Speakers," introduced by Mr. G. H. Nash. 6 p.m.

THURSDAY, JANUARY 6TH.

INSTITUTION OF ELECTRICAL ENGINEERS.—Savoy-place, Victoria Embankment, London, W.C. 2. Paper, "Electrical Equipment of Track on the Underground Railways of London," by Mr. A. R. Cooper. 6 p.m.

FRIDAY, JANUARY 7TH.

INSTITUTION OF ELECTRICAL ENGINEERS: SOUTH MIDLAND CENTRE.—Engineering and Scientific Club, Queen-street, Wolverhampton. Lecture, "Electrical Research," by Mr. W. Wilson. 7 p.m.

INSTITUTION OF MECHANICAL ENGINEERS.—Storey's-gate, Westminster, London, S.W. 1. Informal meeting. Discussion on "Developments in the Carbonisation of Coal," introduced by Dr. C. H. Lander. 7 p.m.

JUNIOR INSTITUTION OF ENGINEERS.—39, Victoria-street, London, S.W. 1. Paper, "Distortion in Heat-treated Case-hardened Carbon Steels," by Mr. P. J. Haler. 7.30 p.m.

TUESDAY, JANUARY 11TH.

ILLUMINATING ENGINEERING SOCIETY.—E.L.M.A. Lighting Service Bureau, 15, Savoy-street, Strand, London, W.C. 2. Paper, "Floodlighting," by Messrs. W. J. Jones, H. Lingard and T. Catten. 6.30 p.m.

FRIDAY, JANUARY 14TH.

MANCHESTER ASSOCIATION OF ENGINEERS.—Midland Hotel, Manchester. Annual dinner.

LAUNCHES AND TRIAL TRIPS.

CITY OF OXFORD, steamer; built by Swan, Hunter and Wigham Richardson, Ltd., to the order of the Ellerman Lines, Ltd.; dimensions, 325ft. long; to carry 4950 tons. Engines, inverted direct-acting triple-expansion, pressure 185 lb.; constructed by the Wallsend Slipway and Engineering Company, Ltd.; trial trip, December 10th.

PERSONAL AND BUSINESS ANNOUNCEMENTS.

WE regret to learn of the death, on the 23rd inst., of Mr. J. Roothaan, of the British Electric Transformer Company, Hayes, Middlesex.

MR. G. E. BAILEY, works manager, Metropolitan-Vickers Electrical Company, Ltd., Trafford Park, has been elected President of the Manchester District Engineering Trades Employers' Association for the second year.

WE are asked to announce that Major Alan Moncrieff, Assoc. M. Inst. C.E., having accepted the appointment of manager of the propaganda bureau of the Indian Cement Manufacturers' Association, has retired from the firm of Messrs. J. Mitchell Moncrieff and Partners, MM. Inst. C.E., consulting engineers, Westminster, and that he expects to sail to India early in January. In consequence, Messrs. Moncrieff and Partners have decided to close their Newcastle office, and their practice will henceforth be carried on solely from their London office at 57–59, Victoria-street, Westminster, S.W. 1.

FOR SALE
Continued from page 2

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Modern 12in. Centre LATHE, by Milwaukee with straight "V" bed, 12ft. long, S.A., S.S. and S.C., gear-box change, &c.
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4in. DITTO, for 440 volts, all complete.
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LARGE HORIZONTAL SET BELT-DRIVEN GEARED THREE-THROW RAM PUMPS, by Campbells: rams 8in. by 12in. stroke, cap. 12,000 g.p.h. to 600ft. series.
VERTICAL STEAM-DRIVEN DOUBLE RAM PUMPS, all cast iron valves, cyls. 8in. by 10in., rams 6in. by 8in., C.I., 7000 g.p.h.; also DITTO, cyls. 6in. by 8in., all cast iron valves and rams, 4in. by 6in. stroke, cap. 3000 g.p.h.
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200 K.W. GENERATOR, by Crompton, shunt wound, interpole, 220 volts D.C., 910 amps., cont. rating, speed 1200 r.p.m.
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For continuation of For Sale Advertisements see page 78.

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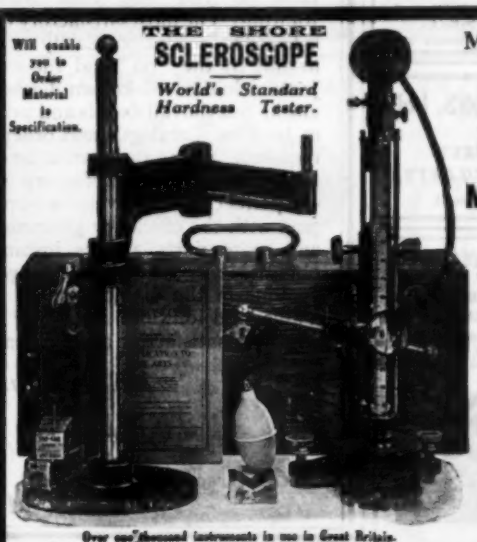

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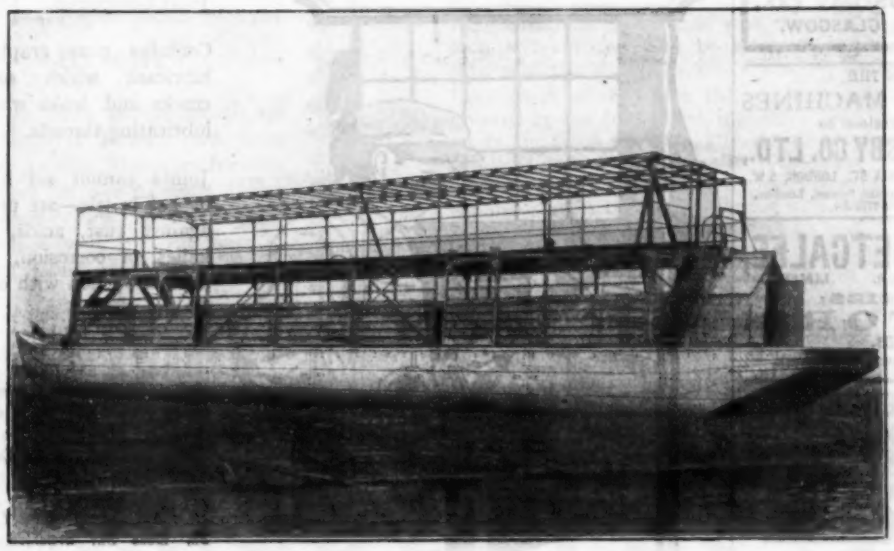

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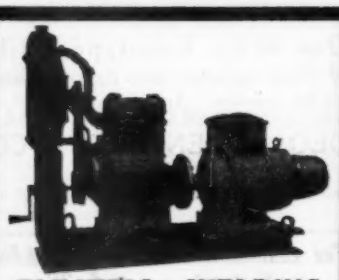
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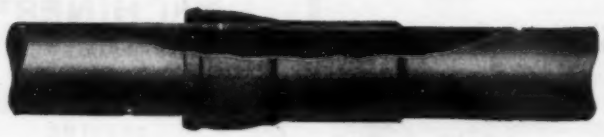

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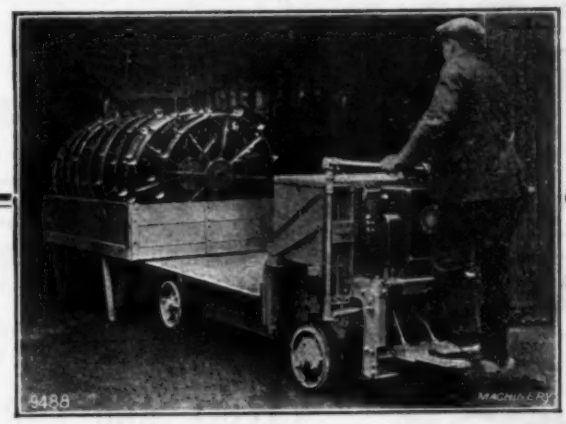

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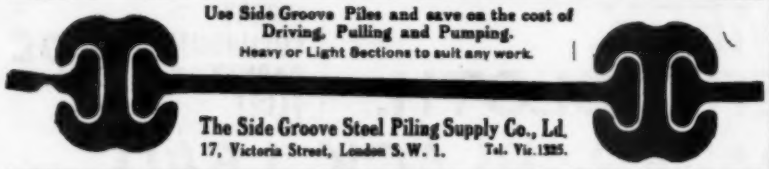

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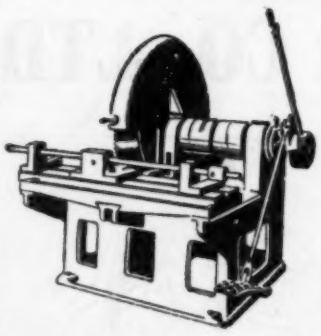

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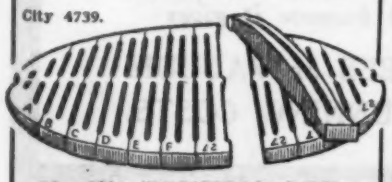

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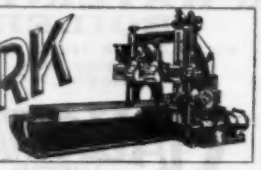

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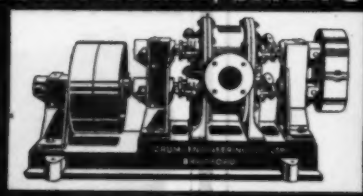

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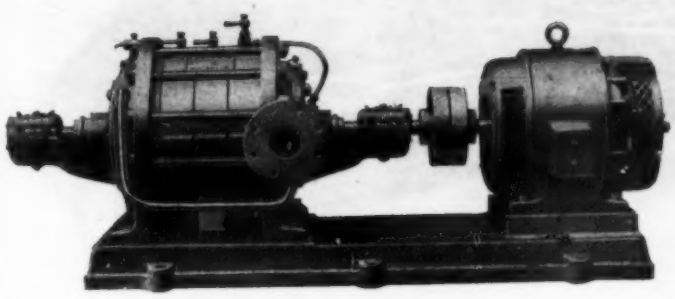

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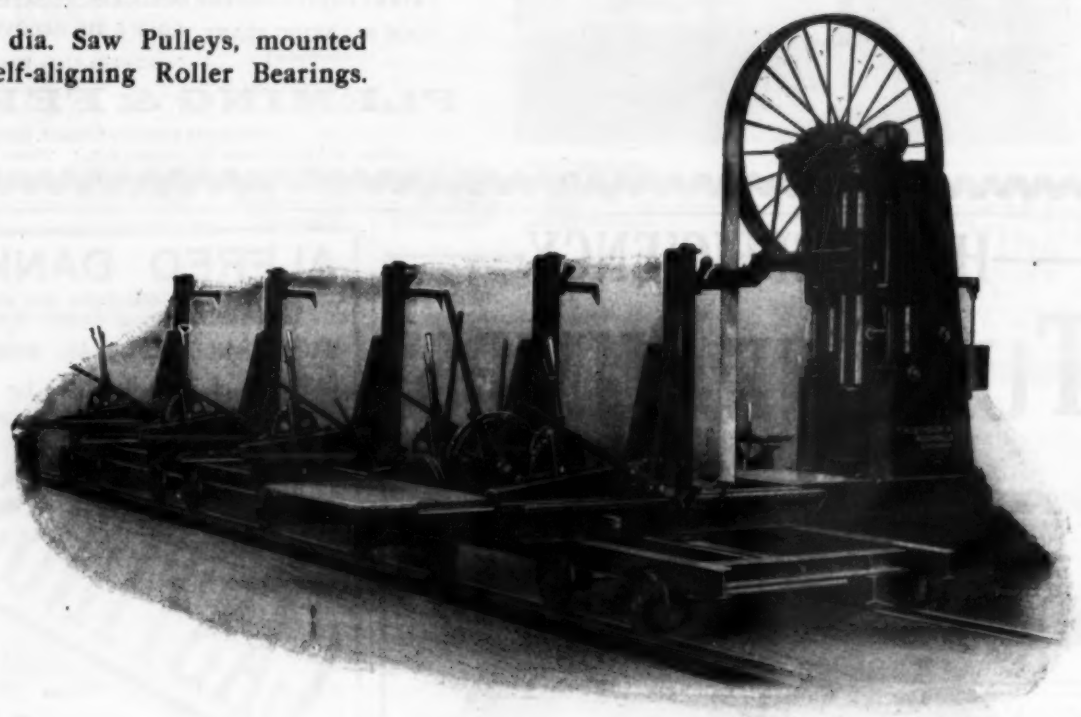

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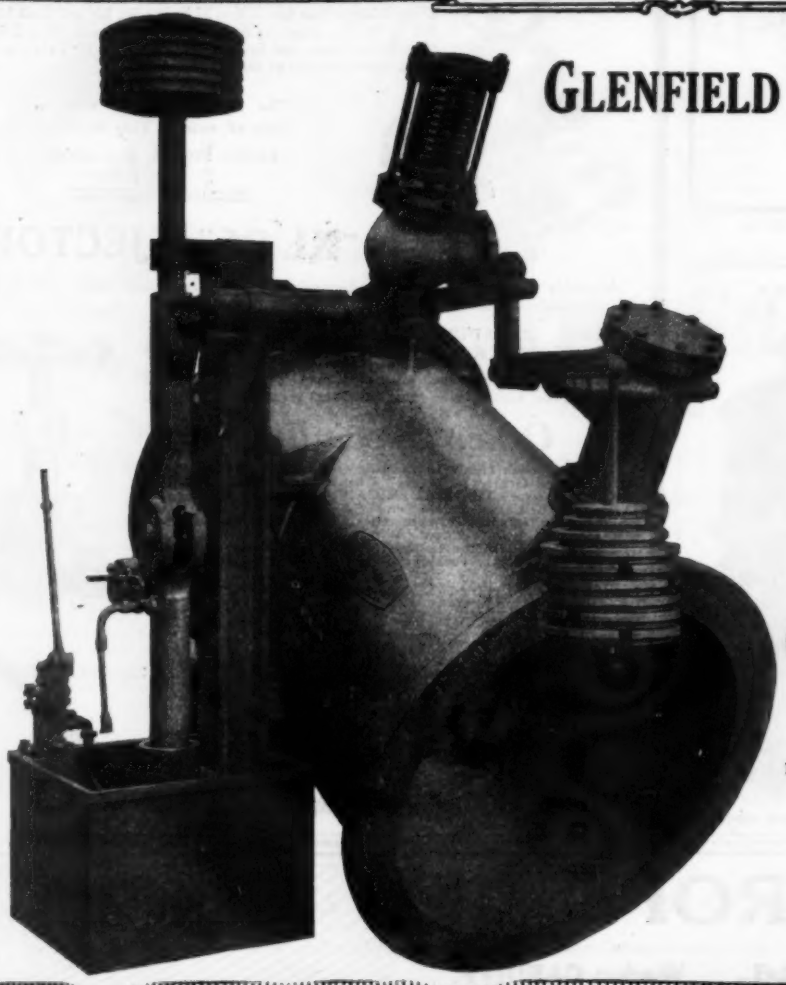

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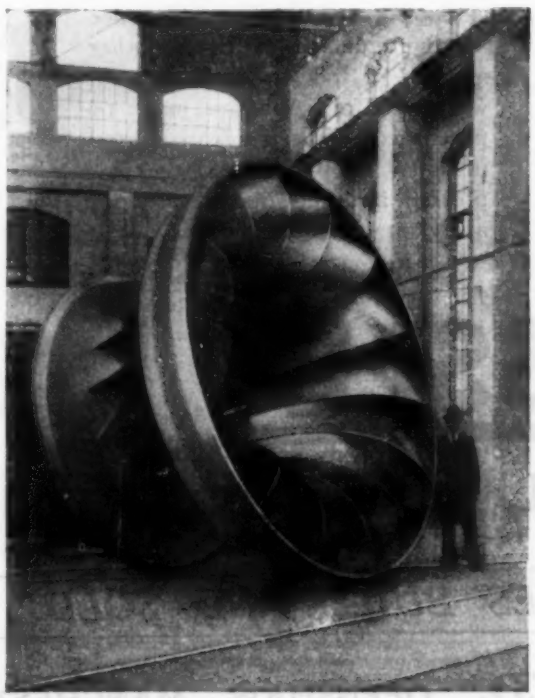

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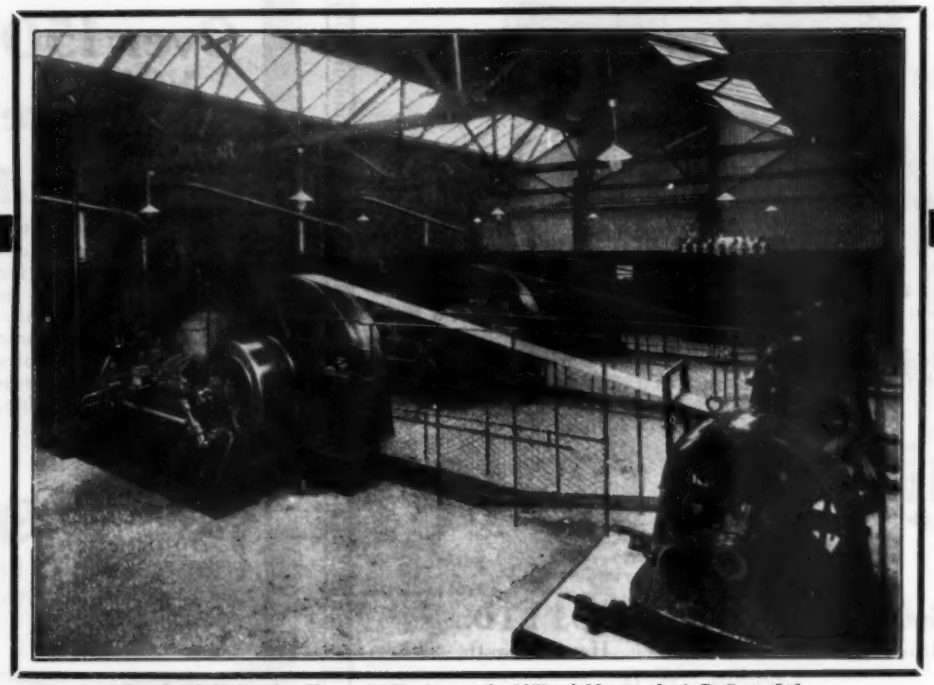

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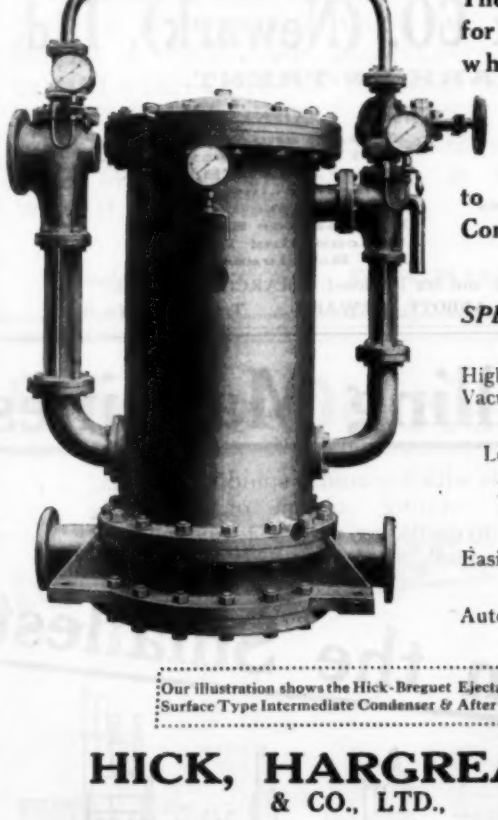

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Low operating costs.

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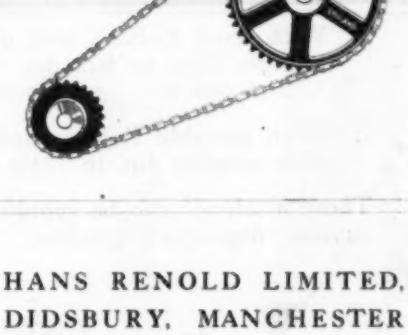

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TO ensure interchangeable threaded work of good quality:—Cut the external thread with a Coventry Diehead. It is highly productive, accurate and can be used on capstan lathes, turret lathes and automatic screw machines.

Gauge the thread with a Wickman Patent Adjustable Thread Caliper Gauge. It can be set to .0001in., is rapid in use and will outlast many solid gauges.

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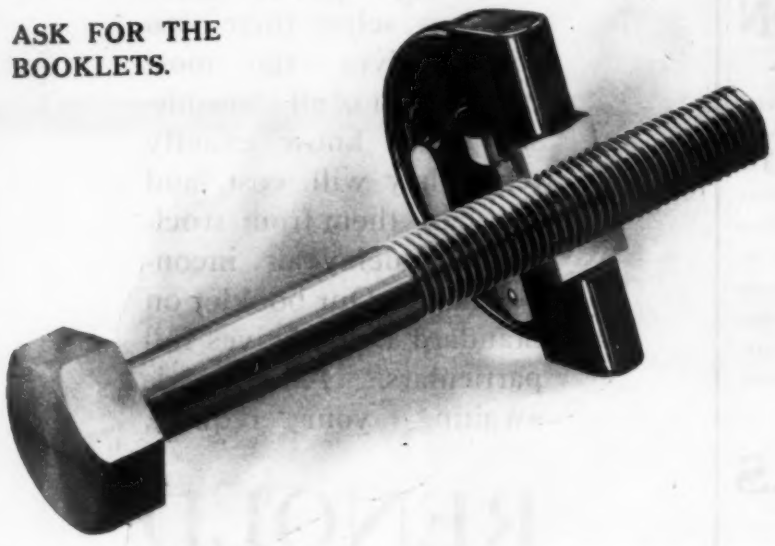

MADE IN THE FOLLOWING SIZES:—

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Ten sizes for Standard Threads:—¼", ⅜", ½", ¾", 1", 1¼", 1½", 2", 3" and 4½".
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The ¼", ⅜", ½" and ¾" sizes are hardened and ground throughout.

WICKMAN THREAD GAUGES:—Made for all the most generally used standards and sizes of screw threads up to 4½".

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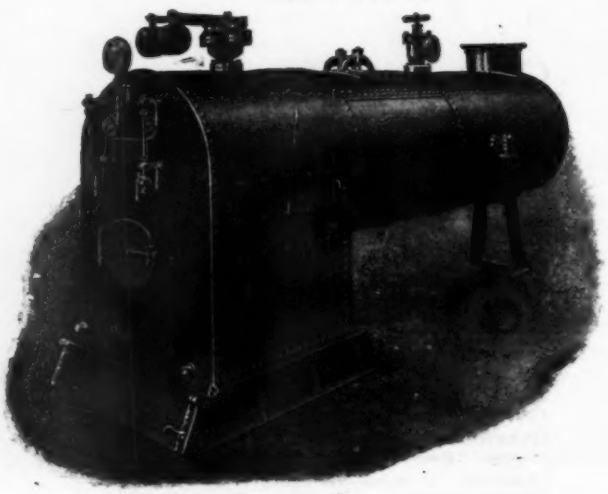

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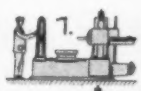
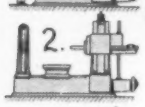
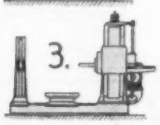
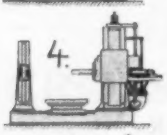


Horizontal Boring & Milling Machines





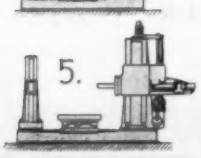


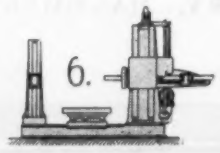
1. With fixed Column and movable table with spindles 2⅜in. to 6in. dia. See Fig. 1, 2, 3, 4, 5. 6 and 8.
2. With movable Column and fixed floor plate with spindles 4in. to 12½in. dia.

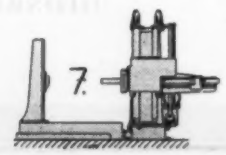
These machines can be supplied with or without auxiliary high-speed spindles.

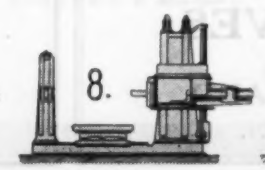
Standard Models with horizontal spindle. Special Machines with rotating column or swivelling spindle (semi-universal), or with rotating column and swivelling spindle (full-universal).

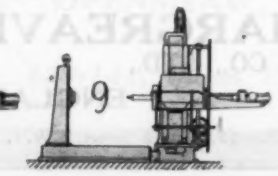
From the Smallest

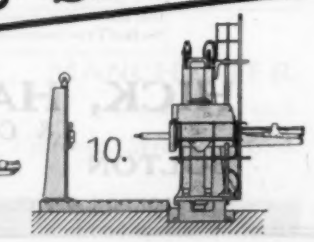












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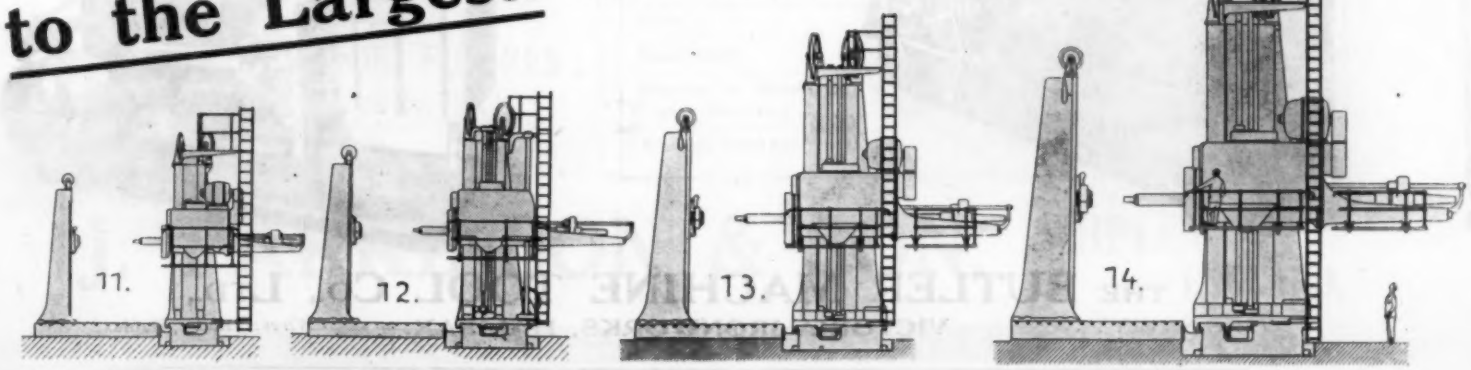

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Vertical Boring and Turning Mills,
Horizontal Surfacing Boring, Milling, Drilling and Tapping Machines,
Side Planers and Slot Drilling Machines
are all that modern machines should be.

SPEED with ACCURACY

is a characteristic feature of Richards Vertical Boring and Turning Mills. Their accuracy enables the machines adequately to meet the exacting demands of precision engineering, whilst their speed of output renders their installation essential when maximum production is required That is why the 6ft. machine shown is installed in the Finnieston, Glasgow, works of Messrs. Harland & Wolff, Ltd., by whose courtesy this photograph is reproduced.

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6" to 32" Stroke.

THE OUTSTANDING FEATURES.

- Stroke adjustment whilst the machine is in motion.
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- The most superbly finished machines on the market.

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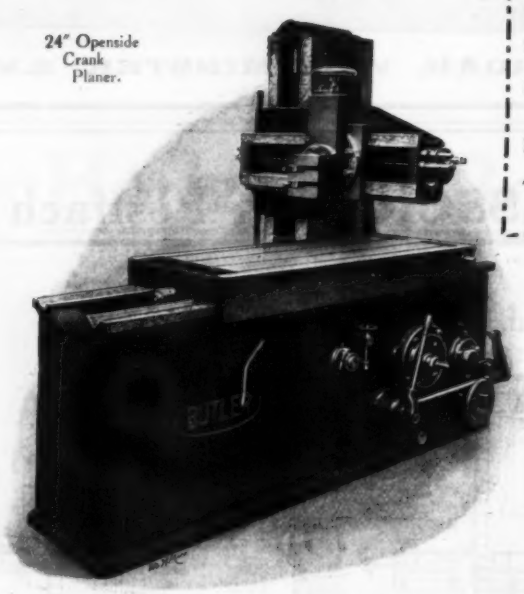
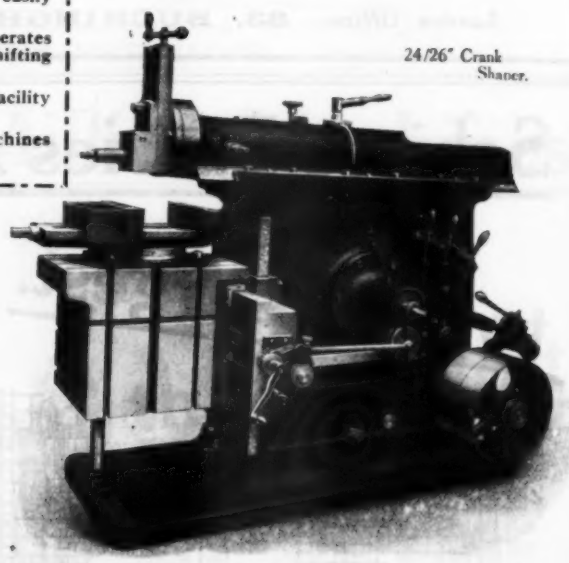


24/26" Crank Shaper.



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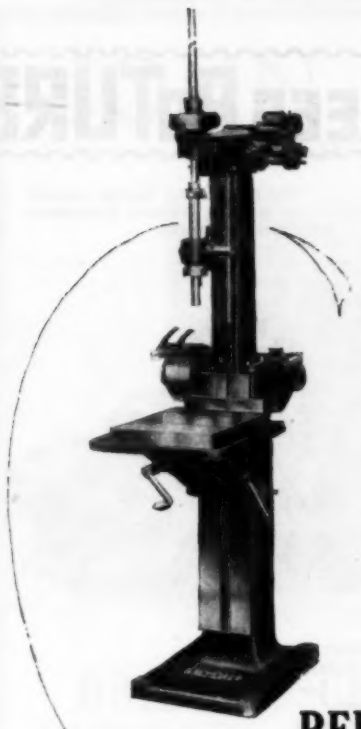

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Our Ball Bearing Sensitive Drills are designed and built to maintain the high standards with which Archdale machines have always been associated. They are well worthy of immediate investigation.

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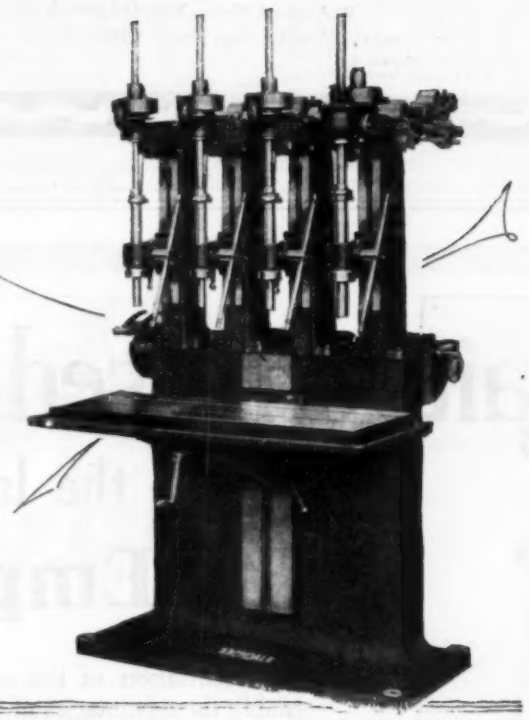
Table is amply proportioned and is easily raised and lowered by handle in front. The head has a vertical adjustment of 8in.
Dimensions and complete specifications, etc., will be sent on request. Please write.



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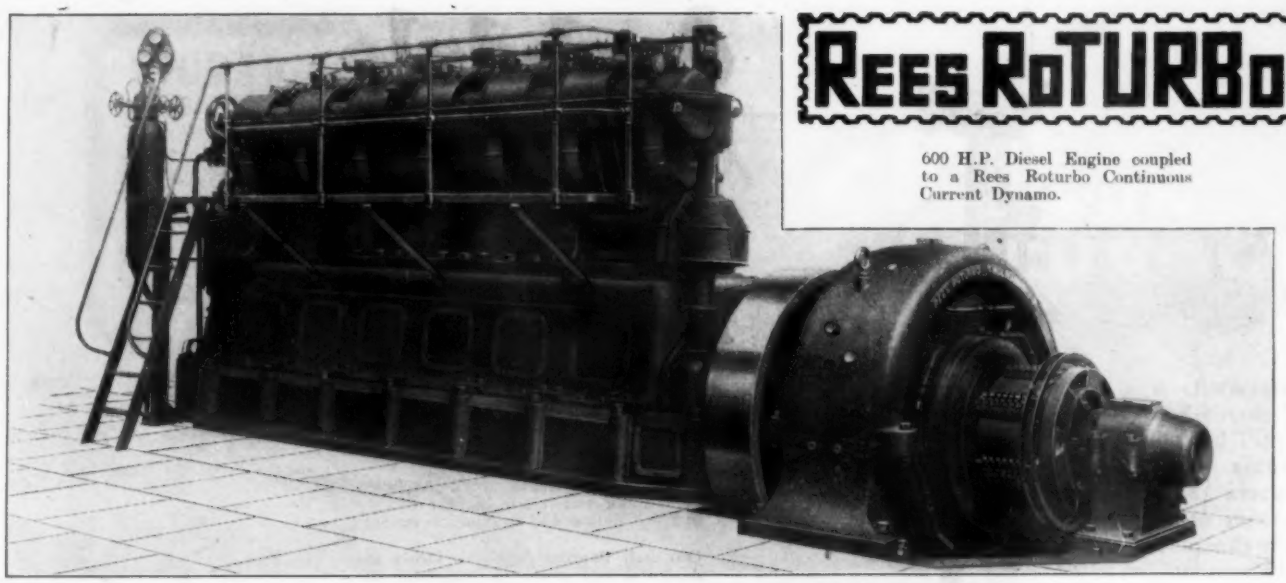

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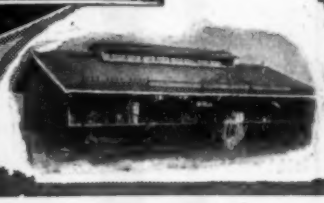

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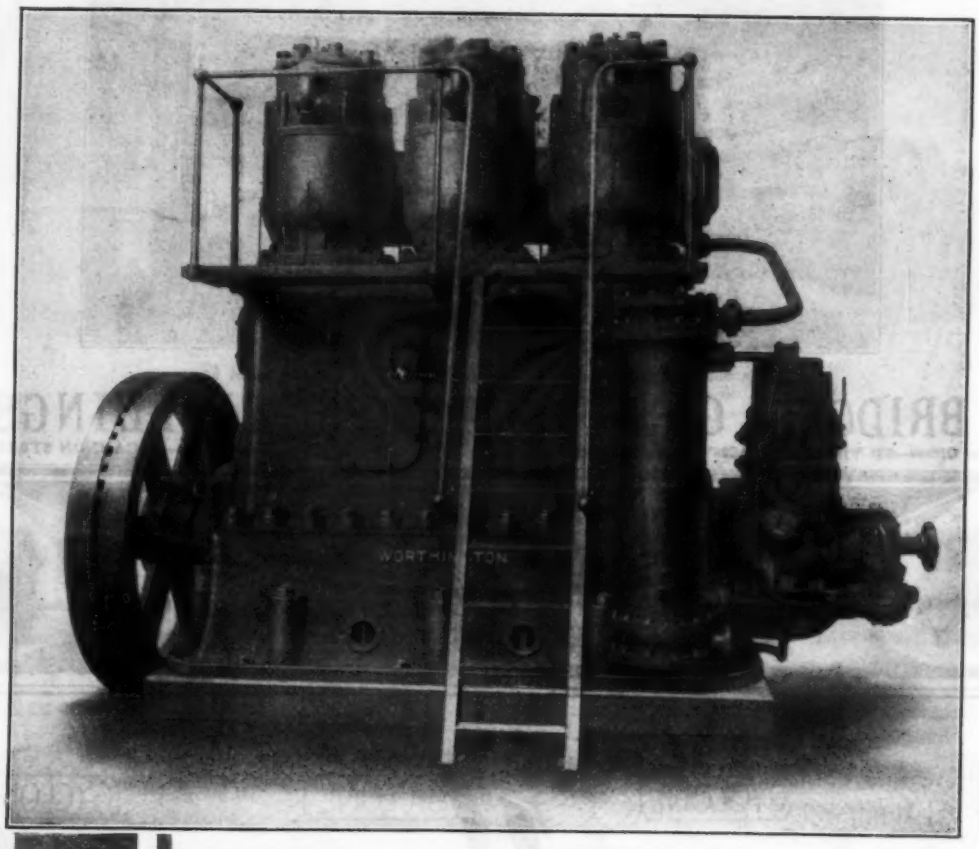

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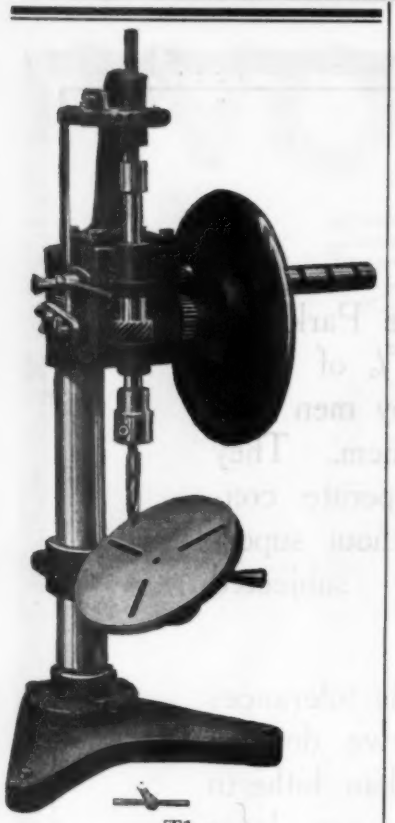

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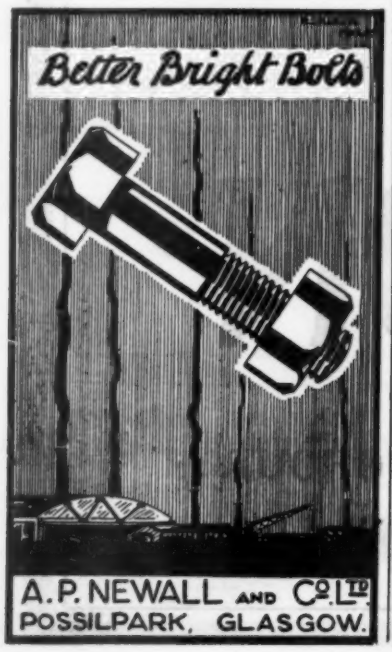

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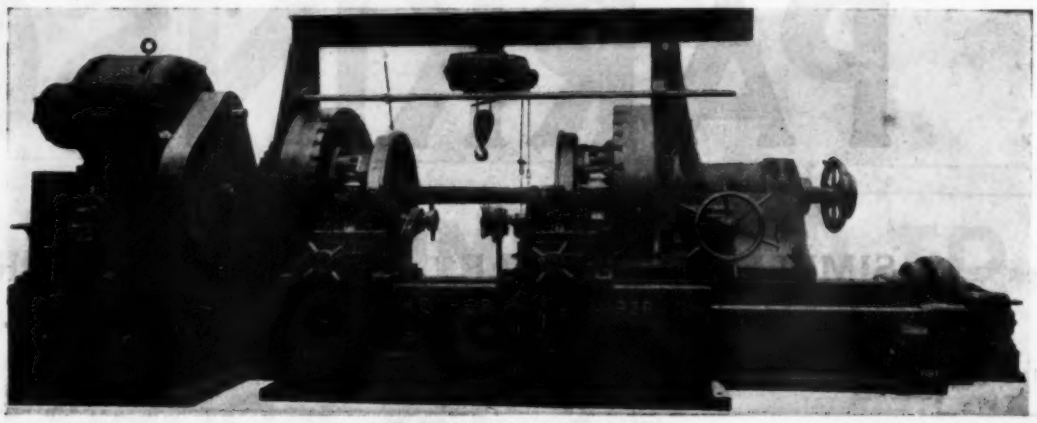


4 FT. EXTRA HEAVY WHEEL LATHE.

DEAN, SMITH & GRACE LTD.

NEW YEAR'S EVE.

The time of retrospect.

Have you given your business a fair chance during the past year by having really up-to-date tools?

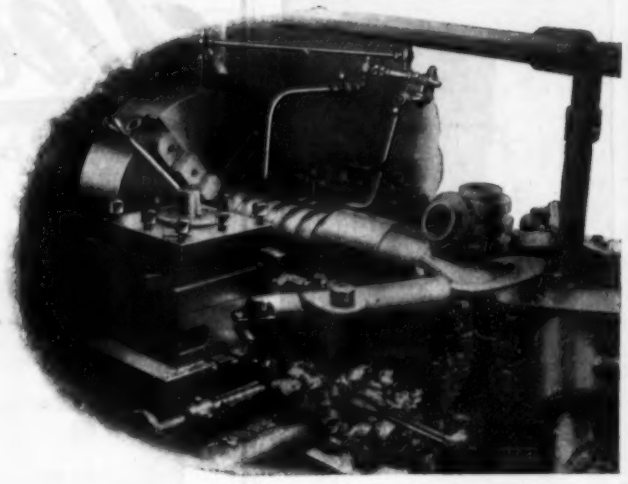
Are you waiting to see the improvement in trade before putting your money into new and better plant? To order your tools when trade does come, and go running *behind* your competitor because you have not had the guts to be in *front.*

The competition in trade in the future won't carry the old and antiquated machinery that it has done in the past.

You "think your machinery is alright"? Have a look round and you may find yourself Rip Van Winkle.

Write for our "gold" booklet:

Time-saving on Lathes.



For particulars of this and other jobs see the "Gold" booklet.

KEIGHLEY.

'Phone. 701, 702 KEIGHLEY.
Telegrams: "LATHES, KEIGHLEY."

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DEAN SMITH & GRACE LTD
KEIGHLEY
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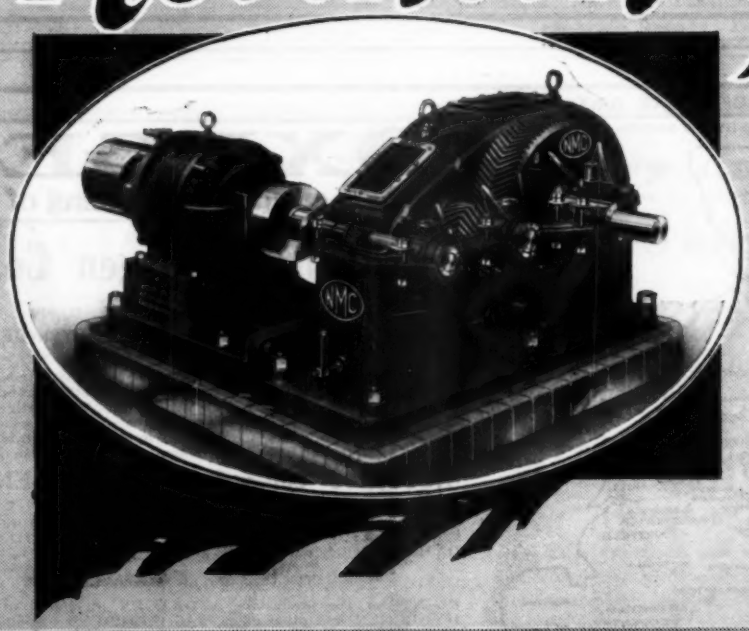
Northern Gears



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WATER SOFTENERS.

SOFTENING 1500 GALLS. PER HOUR AT KENT COUNTY ASYLUM.

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Hundreds of Softeners supplied and treating successfully the most difficult water

Also Makers of all Types of
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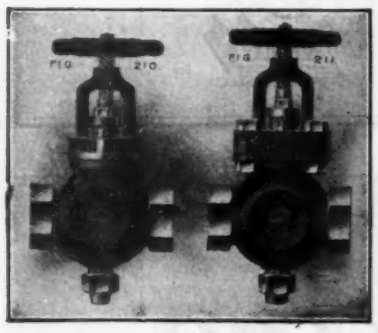
THERE IS A BEST!!
RENEWABLE—
VALVE and SEATING—VALVE.



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Made for Superheated and Saturated Steam in the Steam Users' Interest.
JAMES BALDWIN & CO. Engineers,
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CLAYTON SON & CO. LIMITED

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LEEDS
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VERTICAL BOILERS

LARGE STOCK READY FOR IMMEDIATE DELIVERY

Thor PISTON AIR DRILLS

Provide a Short Cut To Bigger Production.

The powerful ***Thor*** Piston Air Drill makes quick work of hard and unusual jobs. Built like a battleship, it gives constant, satisfactory service under gruelling conditions. Work it night and day, and still you'll find it always ready to increase production and cut down costs.

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The ***Thor*** Piston Air Drill. A sturdy, speedy tool designed for hard work and built to withstand it. This machine in your shop will give surprising results. You owe it to yourself to investigate its possibilities

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Telephone: Victoria 6655. Telegrams: "Thortool," Sowest, London. Cables: "Thortool," London.

DIAGRAM MAP OF GREAT BRITAIN
SHOWING DISTRICTS SERVED BY THE BRITISH OXYGEN CO. Ltd.

OXYGEN
For the cutting and welding of metals

The British Oxygen Co., Ltd.
FOUNDED 1886.

ORIGINATORS OF THE SEAMLESS GAS CYLINDER INDUSTRY.

THE BRITISH OXYGEN COMPANY is the oldest and one of the most extensive oxygen producing and distributing organisations in the world. The history of the Company is the whole story of the birth and development of the Oxygen Industry, and is a record of steady expansion year by year. To-day the Company has factories in all important industrial centres of Great Britain, equipped with the most modern plant, and capable of producing over

4,000,000 cubic feet of OXYGEN DAILY.

THE BRITISH OXYGEN COMPANY also manufacture and supply in cylinders HYDROGEN, NITROGEN, CARBONIC ACID GAS, NITROUS OXIDE, ARGON and OTHER GASES.

The Company are manufacturers of:

PLANT for the production of OXYGEN (in liquid or gaseous state). HYDROGEN and other gases, GAS COMPRESSORS, etc.
They also specialise in the manufacture of OXYGEN METAL-CUTTING APPARATUS, OXY-ACETYLENE, OXY-HYDROGEN, and OXY-COAL GAS WELDING BLOWPIPES, HIGH-PRESSURE GAS REGULATORS, and a large variety of HIGH-PRESSURE GAS APPARATUS.

For catalogues and full Particulars apply to any of the Company's works or to the Head Office:

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London Showrooms: 69, HORSEFERRY ROAD, WESTMINSTER, LONDON, S.W. 1.

Also at CALCUTTA and BOMBAY, and at SYDNEY, N.S.W.

A customer tells the story of "Double Mushet" tools

"We are pleased to be able to inform you that the Profile Tools recently submitted to us for test have done very well. To avoid the trouble of changing gear on the lathe these tools were first tried out at a cutting speed of 15 feet per minute on Sorbitic Tyres and this speed was maintained throughout the test. The right hand tool cut 28 Tyres before grinding and the left hand tool cut 14. It will therefore be seen that both in cutting speed and the number of Tyres turned the minimum requirements were considerably exceeded.

We shall be glad to have your [illegible] these tools in due course."

"the minimum requirements are considerably exceeded . . ."

This is actual evidence from a customer who wanted the best tool for a particularly tough job. Those referred to in the letter were made from our "Double Mushet" H.S. Steel—their performance is not a "freak," it is everyday "Osborn" achievement.

Write for full particulars of "Mushet" H.S. Tools.

175-132

OSBORN'S

DOUBLE "MUSHET" HIGH-SPEED STEEL

SAMUEL OSBORN & COMPANY, LIMITED.

CLYDE STEEL WORKS - - - - - - SHEFFIELD.

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WASTE OIL FILTERS,

with Patent "Sight-Feed" Syphons.

YOUR DIRTIED OIL FILTERED AND RENDERED FIT FOR USE OVER AND OVER AGAIN.

Made in Various Sizes and Special Plant furnished to meet all requirements.

OIL STORAGE CABINETS with special pumps for heavy Oils.

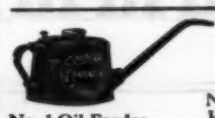
A Variety of Capacities Stocked.

"UNBREAKABLE" OIL LAMPS.

No. 20 Moulders' Lamp.

No. 18 Kettle Torch.

No. 18a Trench Lamp.



No. 1 Oil Feeder.

No. 4 Hand Lamp.

No. 5 Torch Lamp.

LATHE CAN IN TWO SIZES. No. 1 & 2

REMOVABLE BARREL POUR

for emptying Casks.

Instantly attached and removed.

Ensures even flow.

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Works: Carnarvon St., MANCHESTER.

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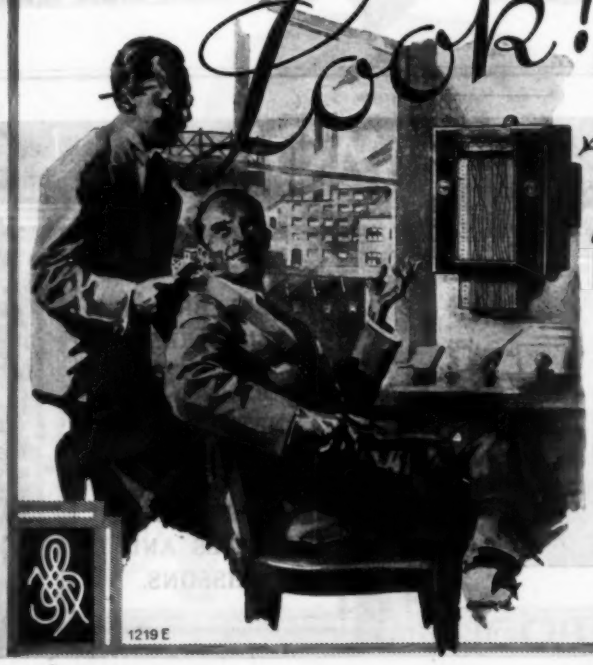

Fuel economy *and* **increased efficiency** *of my plant is insured by the* ***Multi-Recorder*** *of* **HARTMANN & BRAUN A.G.** *Frankfort on Main*

One glance at the coloured curves enables me to see and follow the progress of the most important occurrences in my steam plant, as for instance, the furnace gas temperatures, the superheat and feed-water temperatures, the variations of the pressure and the steam quantities, and furnace blast pressure, the CO_2 contents of the chimney gases, the humidity in the rooms etc., and I am in a position to correct defects or irregularities and thus reduce working expenses.

Ask for list 85a

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Guaranteed Efficiency, Temperature Rise and Overload.

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STEEL FRAMED BUILDINGS,
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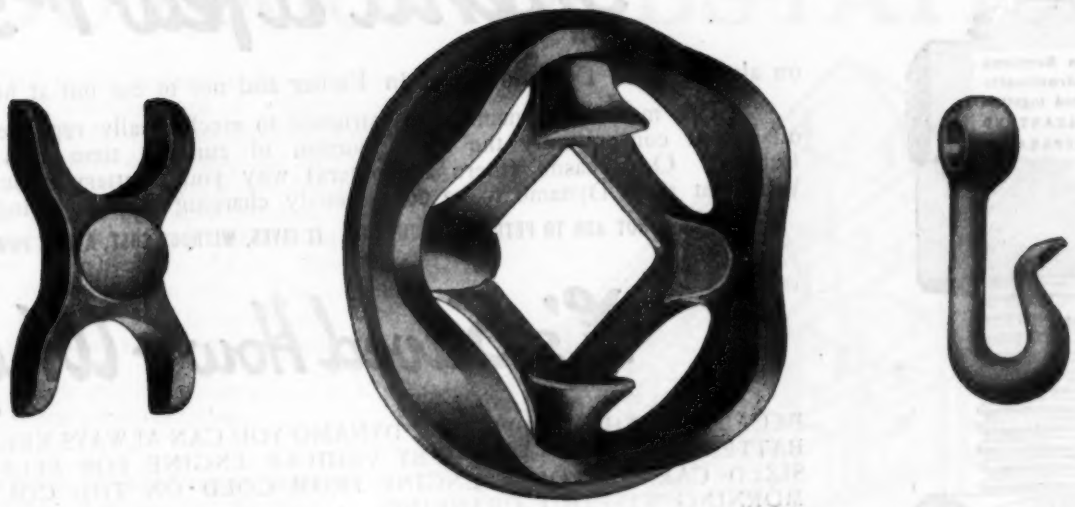

MALLEABLE IRON CASTINGS

BAGSHAWE & CO., LTD.

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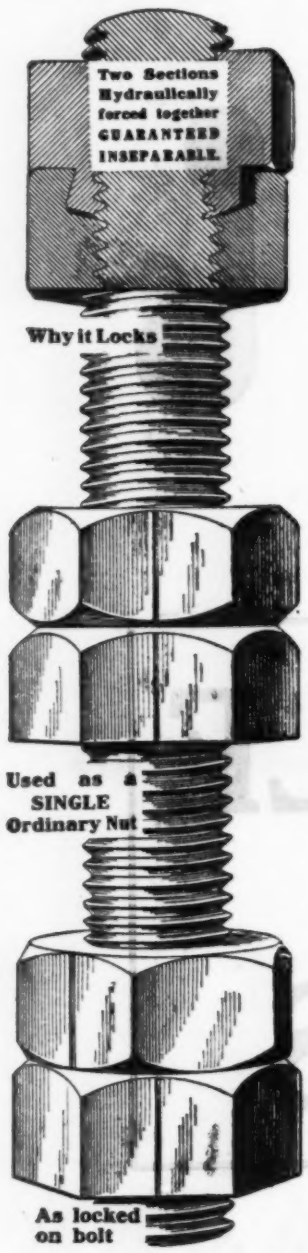
VISLOK

automatically makes

THREE Separate but Simultaneous and Interdependent Locks by the ONE Movement of an ordinary spanner as you lock it.


Two Sections Hydraulically forced together GUARANTEED INSEPARABLE.
Why it Locks
Used as a SINGLE Ordinary Nut
As locked on bolt

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Guaranteed Saves ALL INSPECTION LABOUR

Defies Continuous Intensified Vibrations

Gives Three Locks by One Spanner Movement

To Lorry, Omnibus, Charabanc and Taxi Cab Owners

Entirely of British Origin and Workmanship.

TUNGSTONE Pure Lead Grid Accumulator

Patented and Trade Mark Registered in the Chief Countries of the World.

Spend a few £'s

on altering your Dynamo to cut in Earlier and not to cut out at higher speeds.

The modern Dynamo is constructed to mechanically regulate a very low limit of output consequently the major portion of running time it is not charging the Battery. One reason (there are others) why your Battery is never fully charged. Why not alter Dynamo to be continuously charging at any varying speed.

IT DOES NOT ADD TO PETROL CONSUMPTION. IT GIVES, WITHOUT COST, AMPLE POWER FOR SELF-STARTING.

£'s Saved How + Why

BECAUSE WITH AN EFFICIENT DYNAMO YOU CAN ALWAYS KEEP A TUNGSTONE BATTERY FULLY CHARGED BY VEHICLE ENGINE FOR SELF-STARTING ANY SIZED CAR OR LORRY ENGINE FROM COLD ON THE COLDEST WINTER'S MORNING WITHOUT CRANKING.

Because Tungstone is the Only All Metal Battery in the World. It's an Engineer's job made to last and consequently is practically foolproof with a low upkeep.

Tungstone plate-grids are the only High Pressure Die Cast plate-grids in the World to be made of Pure Lead, which is the only metal that perfectly, reliably and efficiently, generates and stores Electricity by chemical conversion—the primary factor in generating, holding and giving liberal continuous charges and discharges.

Tungstone plates are Thicker and Heavier than any competitive plate and Machine pasted so that they will stand up to continuous and strenuous high charging rates.

Tungstone plates are kept in better condition by Overcharging in preference to Under-charging.

All plates are first partially charged at Works without extra cost to user and are immediately ready for work.

The British Government's Independent and Impartial tests conclusively prove that Tungstone Starter Battery gives the highest Amp. and Watt hour capacity of any Starter Battery in the World. Copy of Official Certificate sent post free on receipt of postcard.

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MAIN TERMINALS AND INTER-CELL CONNECTORS

OF THE

88% Watt Hour Efficiency — A WORLD'S RECORD.

TUNGSTONE Pure Lead Grid Accumulator

ARE

96% Amp. Hour Efficiency — WORLD'S RECORD.

Locked by Vislok

VISLOK universally accepted in Engineering Circles as the ONLY Lock Nut that CAN and DOES PERMANENTLY LOCK

VISLOK

THE ONLY RELIABLE AND SAFETY TRIPLE LOCK NUT IN THE WORLD

T.M.79

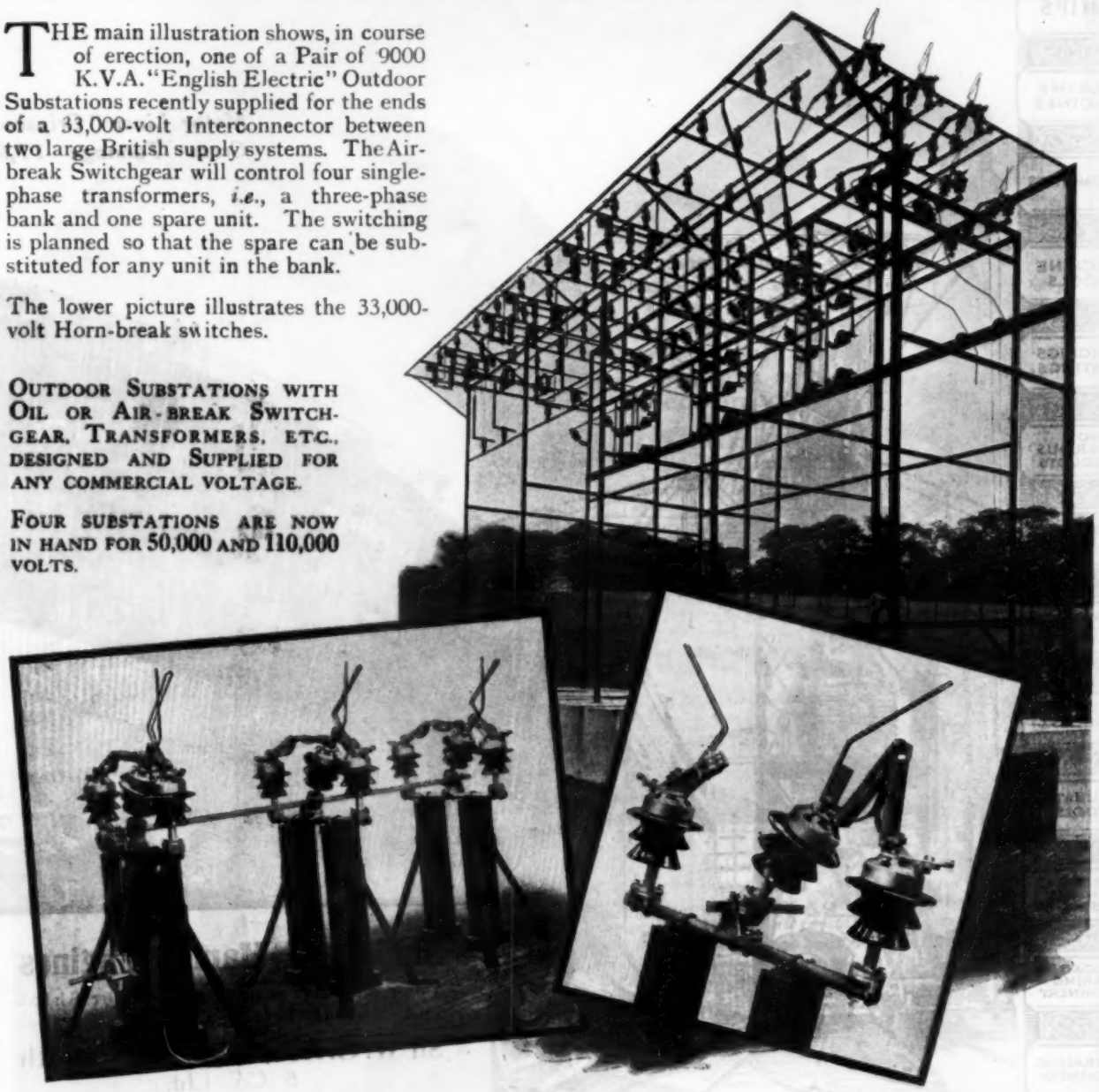
SWITCHGEAR *for* OUTDOOR SUBSTATIONS

THE main illustration shows, in course of erection, one of a Pair of 9000 K.V.A. "English Electric" Outdoor Substations recently supplied for the ends of a 33,000-volt Interconnector between two large British supply systems. The Air-break Switchgear will control four single-phase transformers, *i.e.*, a three-phase bank and one spare unit. The switching is planned so that the spare can be substituted for any unit in the bank.

The lower picture illustrates the 33,000-volt Horn-break switches.

OUTDOOR SUBSTATIONS WITH OIL OR AIR-BREAK SWITCHGEAR, TRANSFORMERS, ETC., DESIGNED AND SUPPLIED FOR ANY COMMERCIAL VOLTAGE.

FOUR SUBSTATIONS ARE NOW IN HAND FOR 50,000 AND 110,000 VOLTS.



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Motor Liner "Gripsholm"
Gross Tonnage 17,993.

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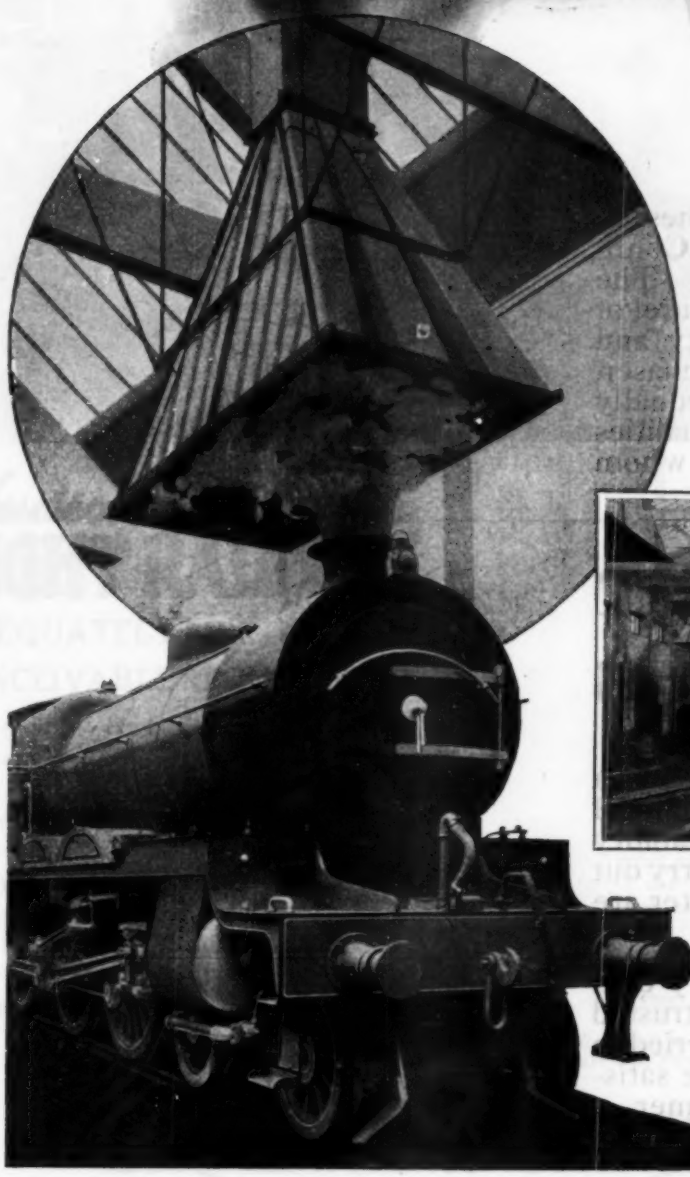
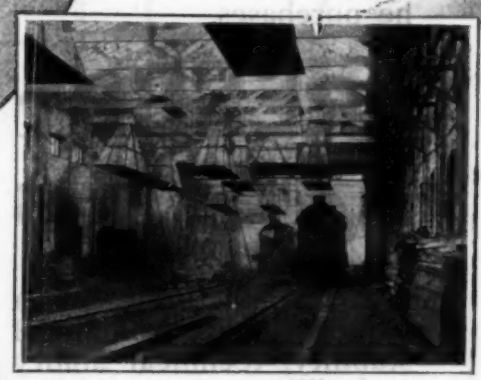
Code: . . . . . Bentley's.

E.P.S. 490

Smoke Ducts





Strong, simply constructed and quickly erected, these DUCTS require the minimum of maintenance, and are economical.

PATENT APPLIED FOR.

Scientifically designed, and constructed of Steel and Asbestos - Cement, these Ducts will resist the exhaust blast and impact from the largest locomotives, and are practically everlasting.

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Makers of STEEL FRAMED ASBESTOS-CEMENT FIRE-PROOF SMOKE DUCTS AND CHIMNEYS.
FOR LOCOMOTIVE RUNNING SHEDS, STEAM WAGON GARAGES, FORGES, WORKS, ETC.

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The basis of all business is, and must always be, Confidence on both sides. The Supplier must be sure of the financial stability and integrity of the Purchaser. The latter must be equally certain that these qualities exist in those from whom he purchases.

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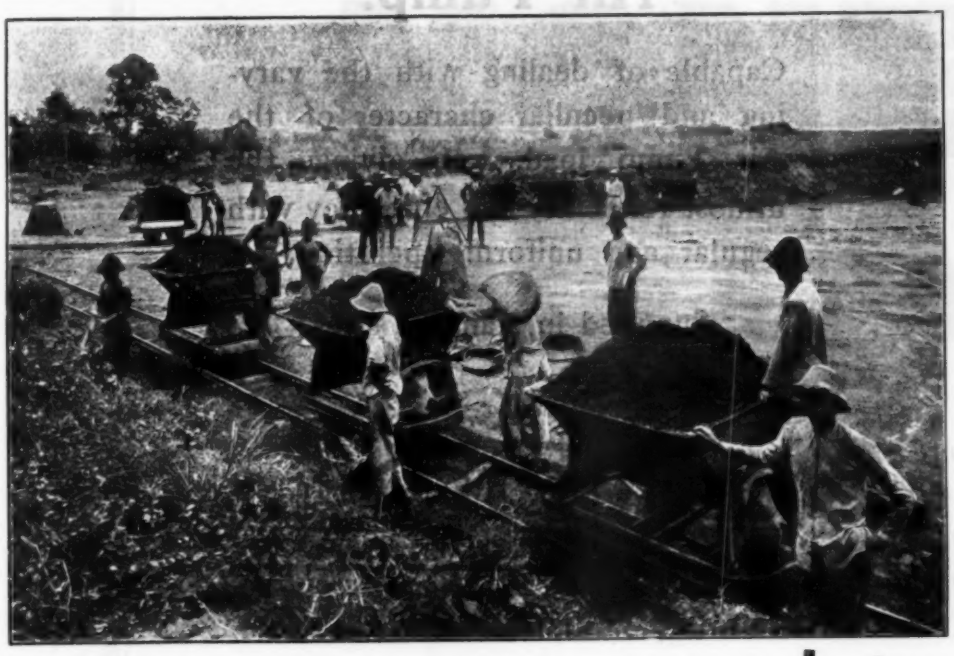
are manufactured by a Concern whose financial stability, technical ability and willingness to carry out a contract to the letter are above question.

You may have every confidence that work entrusted to the B.I. will be carried to its ultimate end—the satisfaction of the Customer.

BRITISH INSULATED CABLES
LIMITED,
Cablemakers and Electrical Engineers.
PRESCOT LANCS.

ROBERT HUDSON LTD



HUDSON WAGONS
AT WORK IN THE
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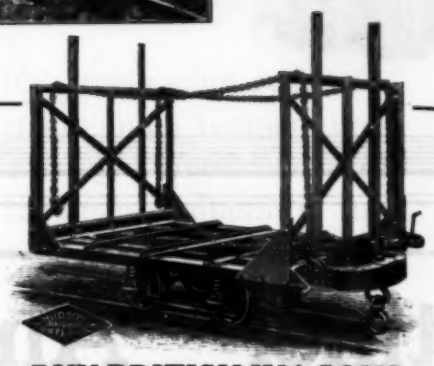
Hudson Light Railway Equipment is to be found giving entire satisfaction in every part of the World. Every Light Railway requirement is catered for, and every Wagon is of the highest degree of strength and reliability.

Hudson Material for LIGHT RAILWAYS

ADEQUATELY MEETS EVERY CONCEIVABLE REQUIREMENT

There is a Hudson standard type of material for every Light Railway requirement. In gold and diamond mines, collieries and quarries, on nitrate fields, sugar, sisal, timber and rubber estates, cotton and tea plantations, on dock, road, railway and reservoir constructions, in industrial plants of various kinds, Railway Material made by Hudson's is in use, giving splendid service.



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Hudson British-built Wagons are the result of over sixty years' experience of manufacturing Wagons for every imaginable purpose. That is why the name "Hudson" on a Wagon is a proof of dependability. Made in standard sizes, gauges and capacities to meet every requirement.

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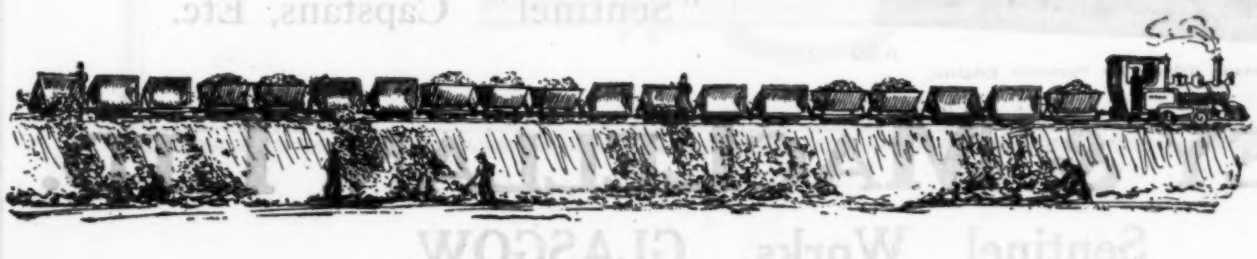

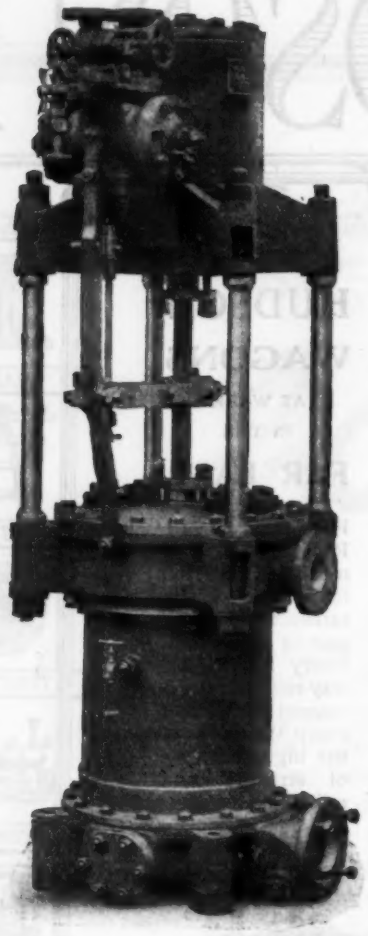

The Weir "Monotype" Air Pump.

Capable of dealing with the varying and peculiar character of the Air Pump load, yet giving the utmost reliability and efficiency with regular and uniform operation.

Supplied in standard sizes.

G. & J. WEIR LTD.
CATHCART : GLASGOW :

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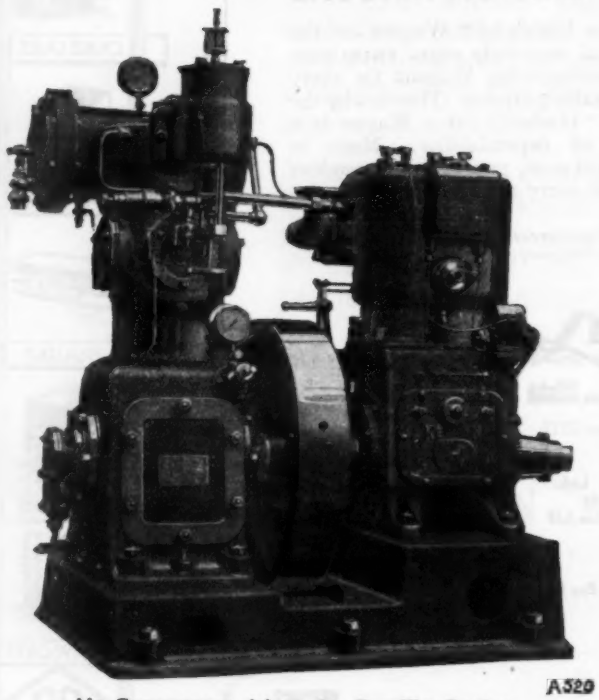
"Sentinel" Air Compressors



A529

Air Compressor driven by Paraffin Engine.

If you have a Compressed Air Problem to solve, let us know and we will send one of our experts to consult and advise you, this without any obligation on you.

Being Specialists in this line, we have always in stock or in progress Machines of all sizes and types from which we can supply to meet any requirement.

No. 16 Air Catalogue free on application.

We are also the Makers of the

"Sentinel" Ash Hoists
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ALLEY & MACLELLAN, LTD.

Sentinel Works, GLASGOW.

Valves are made at Sentinel Valve Works, Worcester.

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In · every · Industry where resistance to corrosion is a factor in operating costs or quality of product, Monel Metal is rapidly being recognised as the standard engineering material.

Its · unique · properties, embracing resistance to corrosion, superheated steam, high temperatures, acid and alkaline conditions, etc., combined with its steel-like strength, toughness, ductility and silver-like appearance, have created for it a sphere of uses unknown to any other commercial metal.

A · sound · investment. Engineers, Textile Manufacturers, Dyers, Bleachers, Launderers, Chemical Manufacturers, Food Specialists, Hotels, Restaurants, Hospitals, etc., have found its use a sound investment.

What about it for your problem? We shall be pleased to discuss that question with you, free from all obligation. Write for our booklet —— M.I.

G. & J. WEIR, LTD.
CATHCART GLASGOW

M 82

Steel Forgings

Handed down from generation to generation, the craftsman's pride in turning out a fine product is strikingly in evidence amongst the workers in the Firth Forge Shops.

Whilst the most up-to-date equipment is everywhere available throughout the shops, the old handicraft methods are retained wherever experience has proved that they produce the best results. The scientist, however, has made these results more sure.

This is typical of how the Firth organisation is able to contribute towards higher quality in the steel forgings you buy.

The Firth organisation is ever ready to bring the whole of its specialised experience to bear upon any problem connected with the production of "better" steel forgings of either a simple or a complicated nature.

The photograph shows Gear Wheel Shrouds (before machining) and an Upper Rudder Stock.

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Crankshafts (solid forged or built up).
Thrust, Intermediate and Propeller Shafts.
Turbine, Rotor and Gear Wheel Shafts.
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Locomotive Crank Axles.
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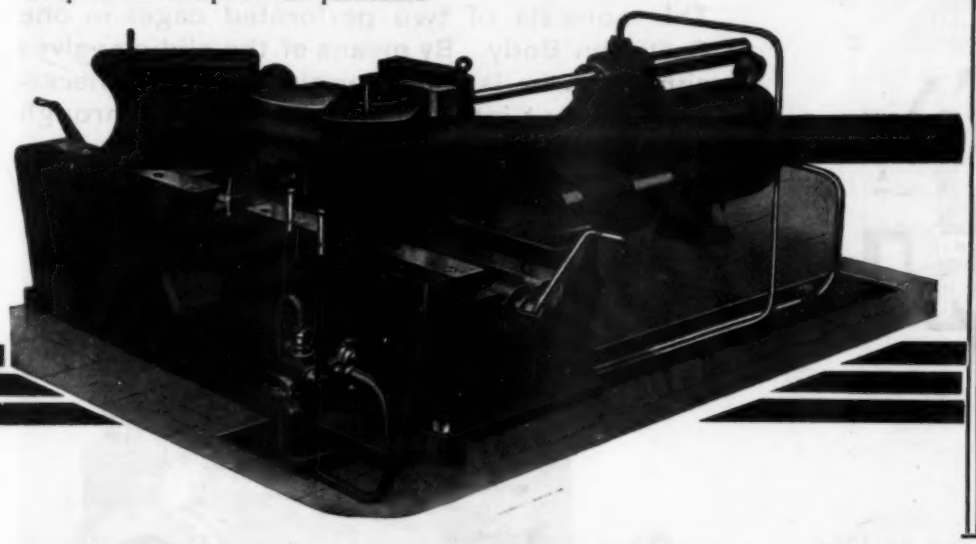
The illustration shows our latest type of Hydraulic Pipe Bending Press made specially for bending copper and steel pipes of large diameter, being capable of bending pipes up to 12in. diameter.

We make this machine in any size to suit customers' requirements, and shall be pleased to quote on receipt of full particulars.



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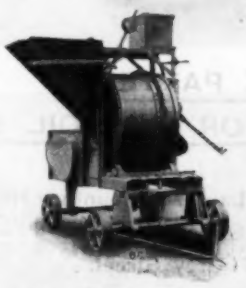
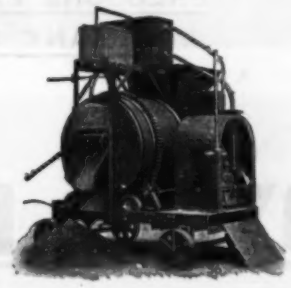
WE HAVE A LARGE STOCK of CONCRETE MIXERS ready for IMMEDIATE DELIVERY.

BUY Ransome—British and Best. Trust a Ransome-built machine to work hard and wear well; trust it to give you a service second to none—efficient in every sense of the word, yet economical in running costs.

We are largest manufacturers in the British Empire of High-Class Concrete Machinery and Tar and Bituminous Macadam and Asphalt Plant; also Manufacturers of the well-known Ransome Type D Steel Sheet Piling in six weights, and all kinds of Piling Plant; Contractors to the British Admiralty, War Office, India Office; Crown Agents for the Colonies, Colonial and other Governments, Public Bodies, and Large Industrial and Constructional Concerns.





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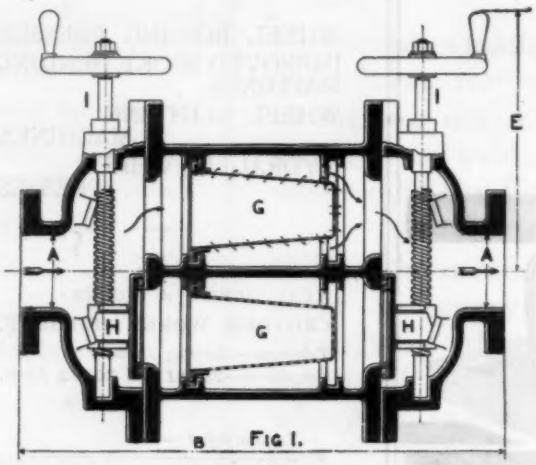
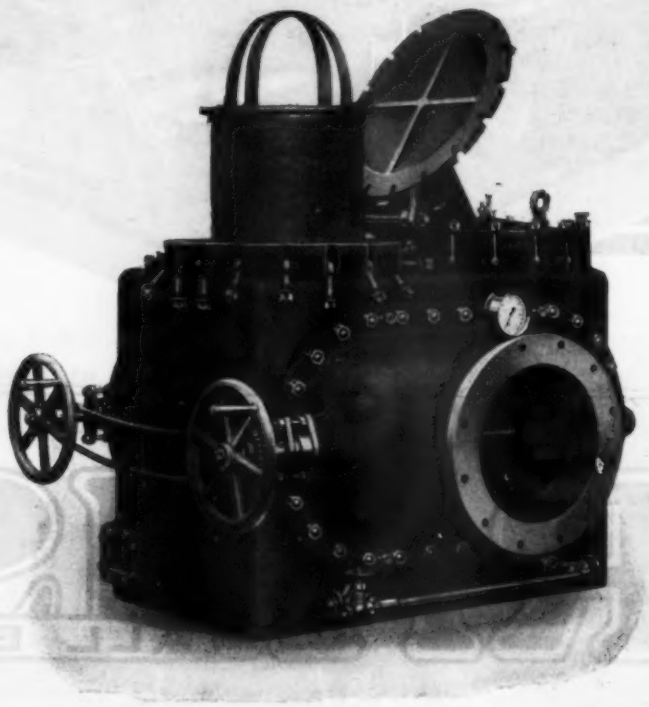


FIG I.

SECTION.

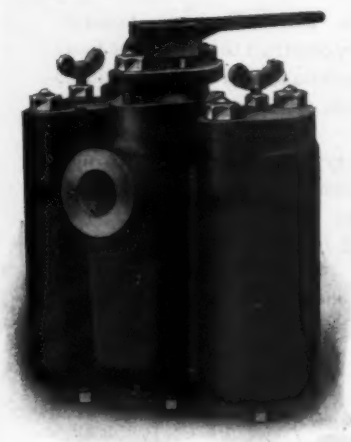
The Sectional view shows our Standard pattern for pump suctions.

This consists of two perforated cages in one Cast Iron Body. By means of the sliding valves either can be isolated for cleaning when necessary, without interfering with the flow through the pipe line.



The illustration opposite shows an 18in. Strainer—one of a group of four recently supplied—and is of an alternative design which has proved more suitable for the larger sizes.

PRESSURE PATTERN
IN MANY SIZES.



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VICKERS LIMITED
ENGINEERS' SMALL TOOLS

VANADIUM HIGH SPEED DRILLS
PATENT ADJUSTABLE REAMERS

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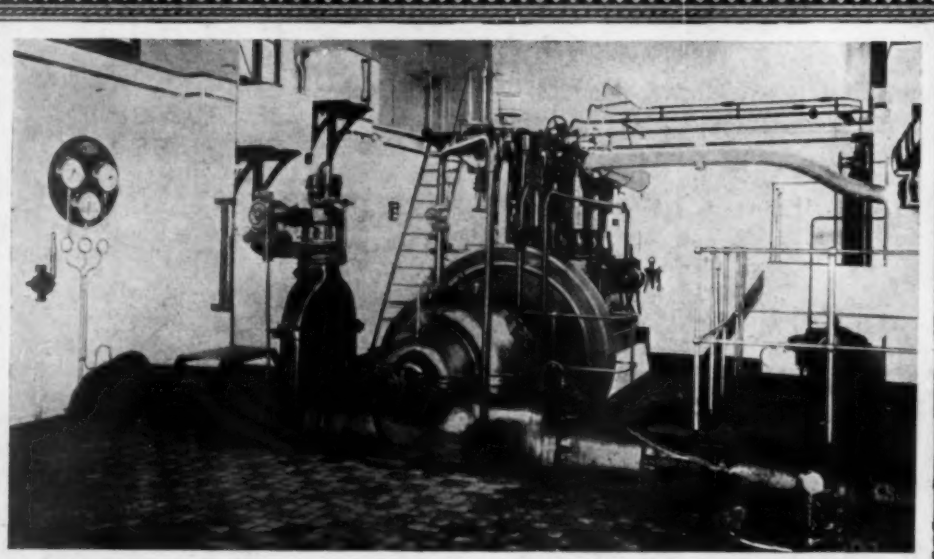
High Efficiency!

"Conqueror" Pumping Plant



5

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DIESEL ENGINE DRIVEN PLANT GIVES HIGH EFFICIENCY RELIABLE RUNNING & LOW MAINTENANCE COST.

Illustration Shows "Allen" Diesel Engine Driven Centrifugal Intake Pump Installed in China.

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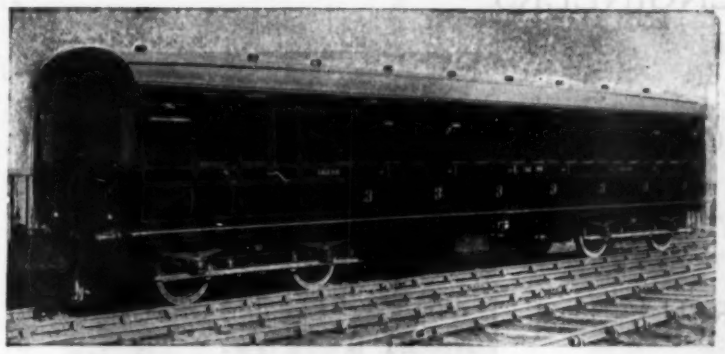

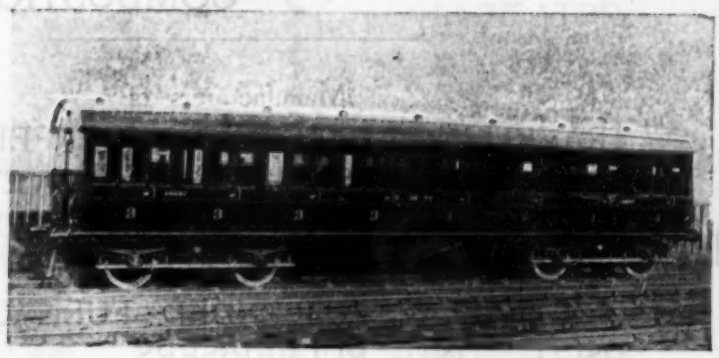

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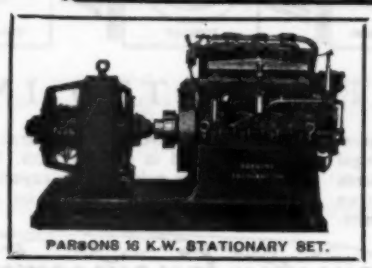

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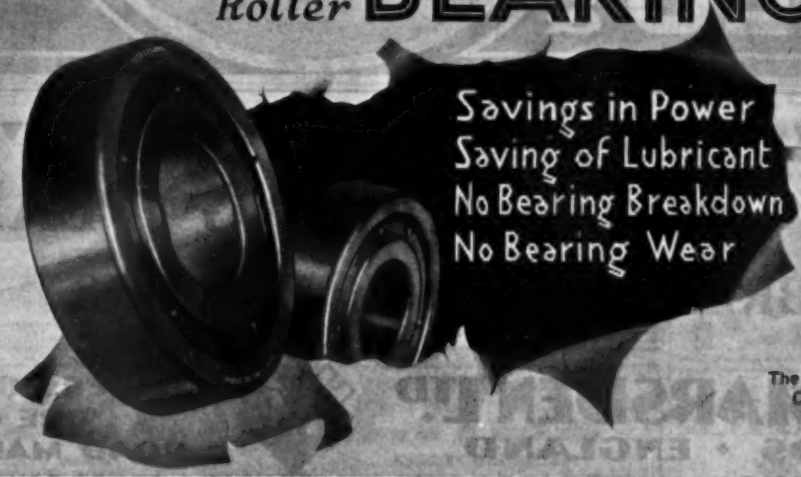

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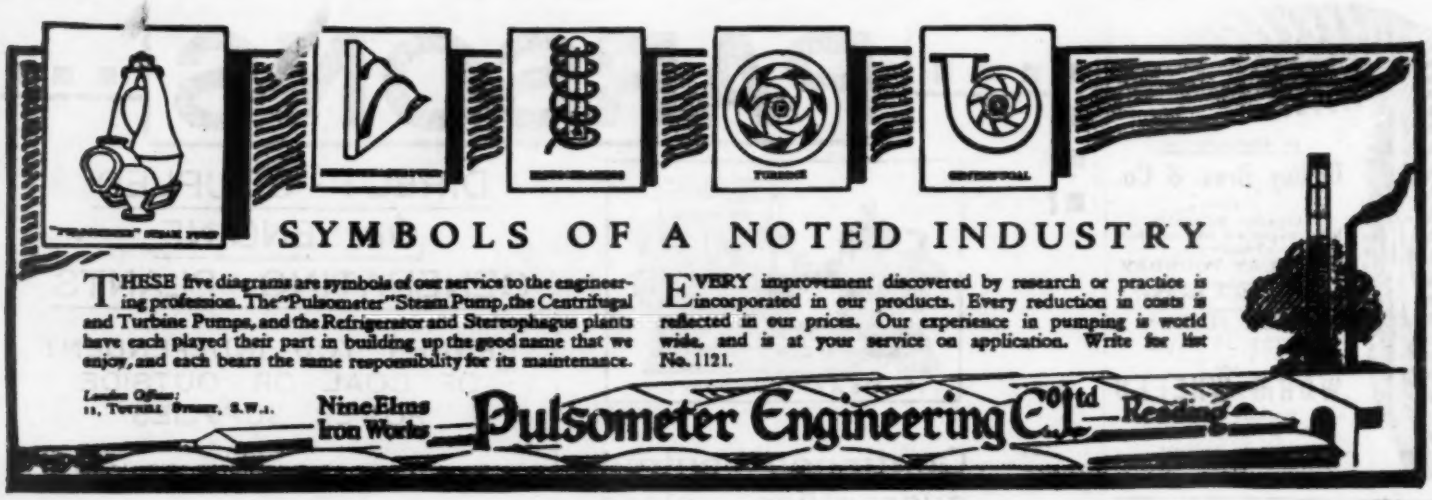
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EVERY improvement discovered by research or practice is incorporated in our products. Every reduction in costs is reflected in our prices. Our experience in pumping is world wide, and is at your service on application. Write for list No. 1121.
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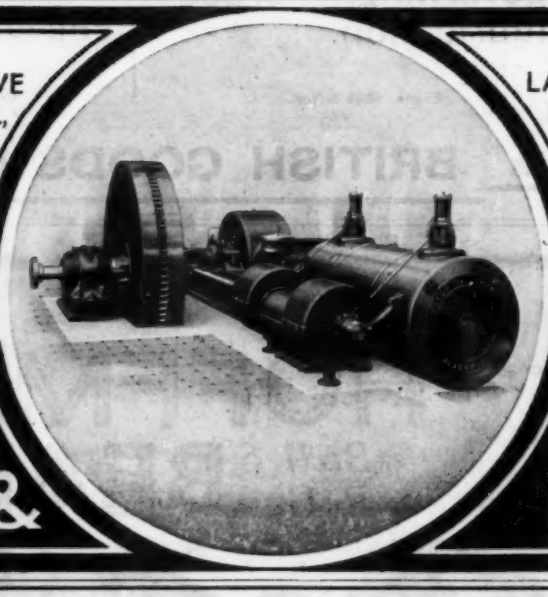

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Edgar Allen & Co. Limited

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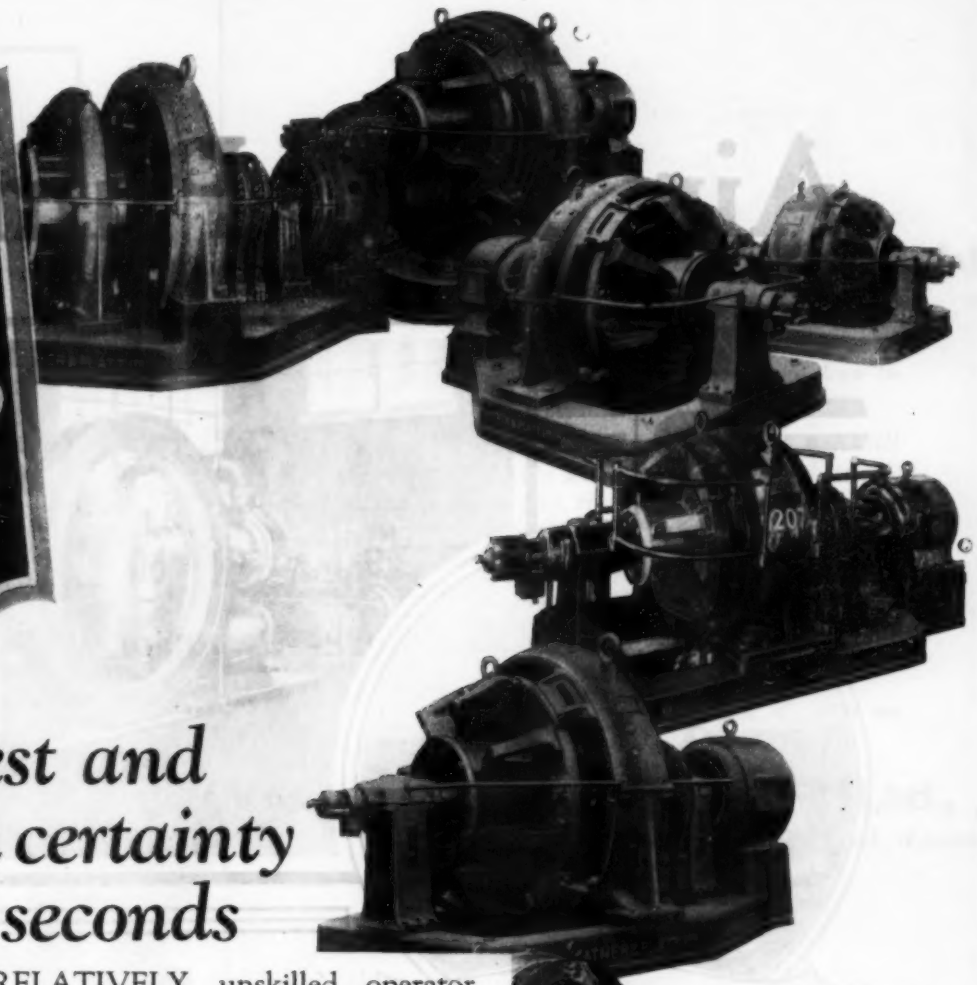

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A RELATIVELY unskilled operator can start up a M. & P. Rotary Converter of any size from rest, synchronise with ease and absolute certainty, and have the machine ready for service in about 30-40 seconds.

Our Patent Starting and Self-Synchronising System provides a safe, simple and certain method of synchronising automatically, without the use of brush-lifting gear. This makes the M.&P. Rotary Converter eminently suitable for installation in unattended sub-stations.

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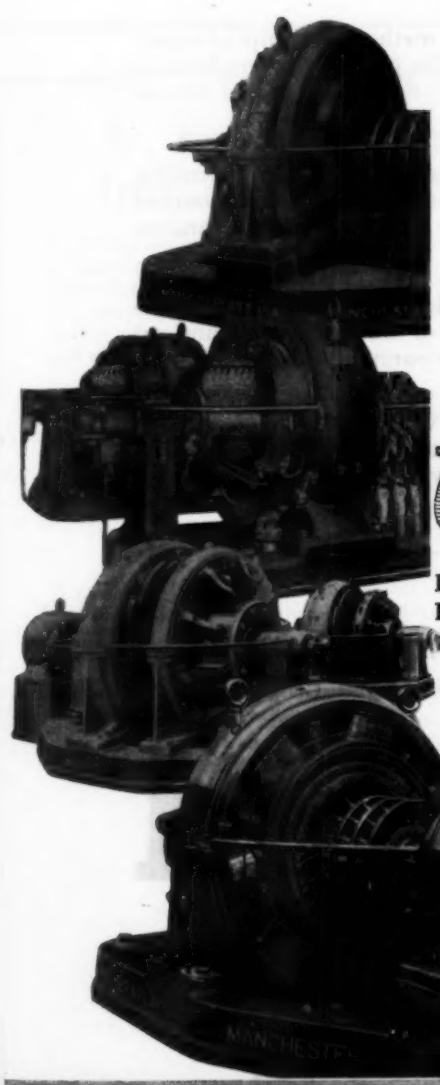

THE MACHINES ILLUSTRATED

range from 200 to 1,500 K.W., and are amongst those supplied to Cardiff Corporation, Bath Corporation, Liverpool Corporation, Barnes U.D.C., and Manchester Corporation. Other machines illustrated were supplied to Steel Works, Collieries and industrial concerns.

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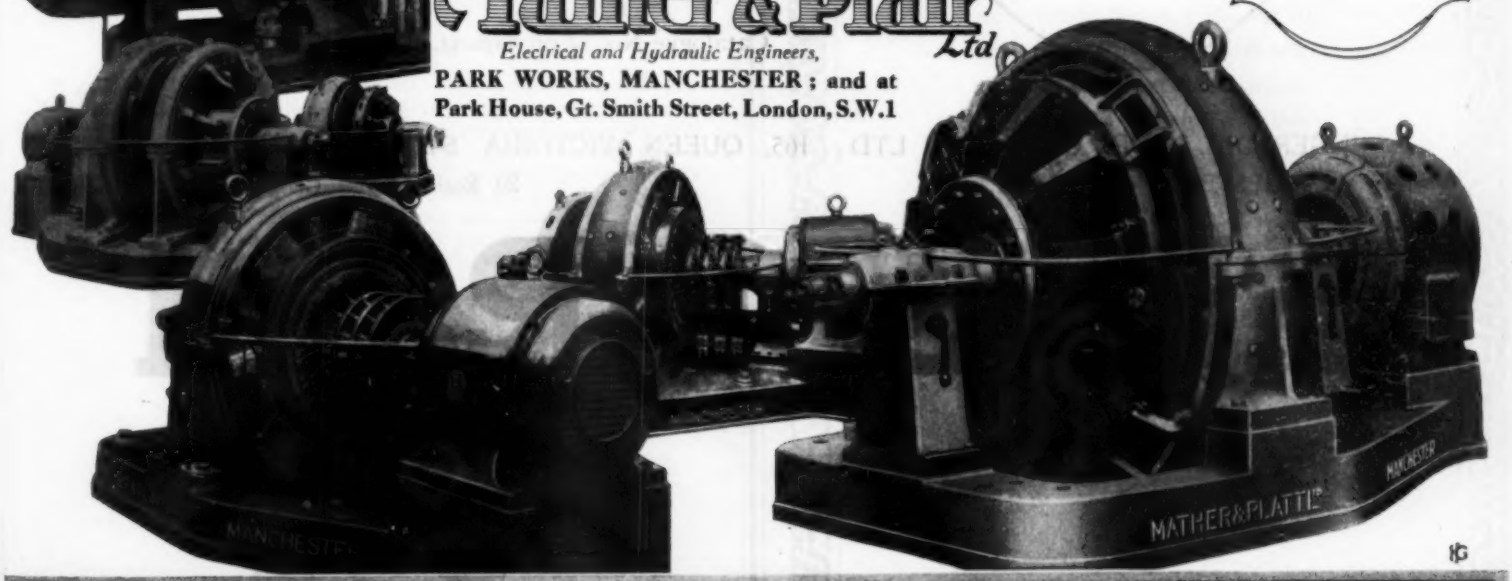

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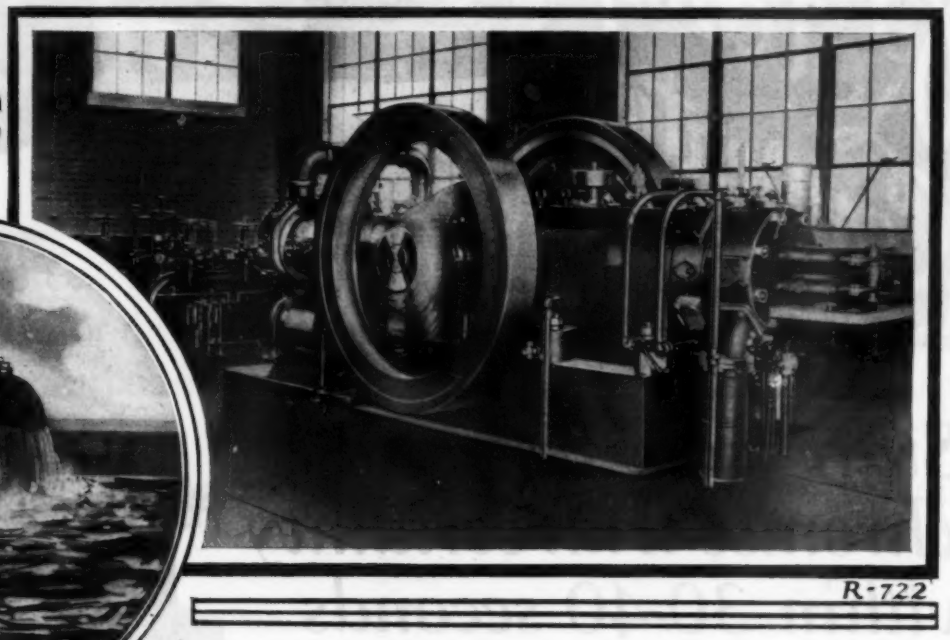

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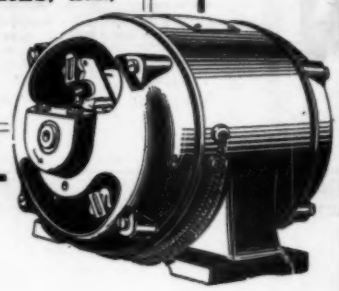

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Cost of Bearings, £2500. Savings effected yearly.	
15% on 1000 HP. at £8 per HP. per annum	£1200
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An investment yielding about 60% yearly.

It will be realised that the cost of HP. per annum differs with geographical and other conditions. The other two factors of maintenance and lubrication costs will, however, remain good in the huge majority of cases. To apply these figures to your own works at your own plant is a simple matter. We will tell you the cost of equipping them completely with Hyatt Lineshaft Bearings, your accountant will give the important figure of HP. cost per annum, and you can then visualise at once just what saving these Bearings would effect for your own works. There is no obligation or expense involved. Surely it is worth while?

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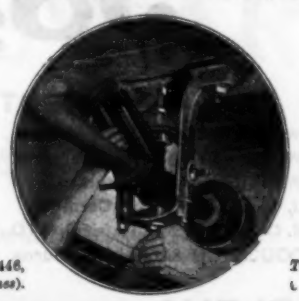

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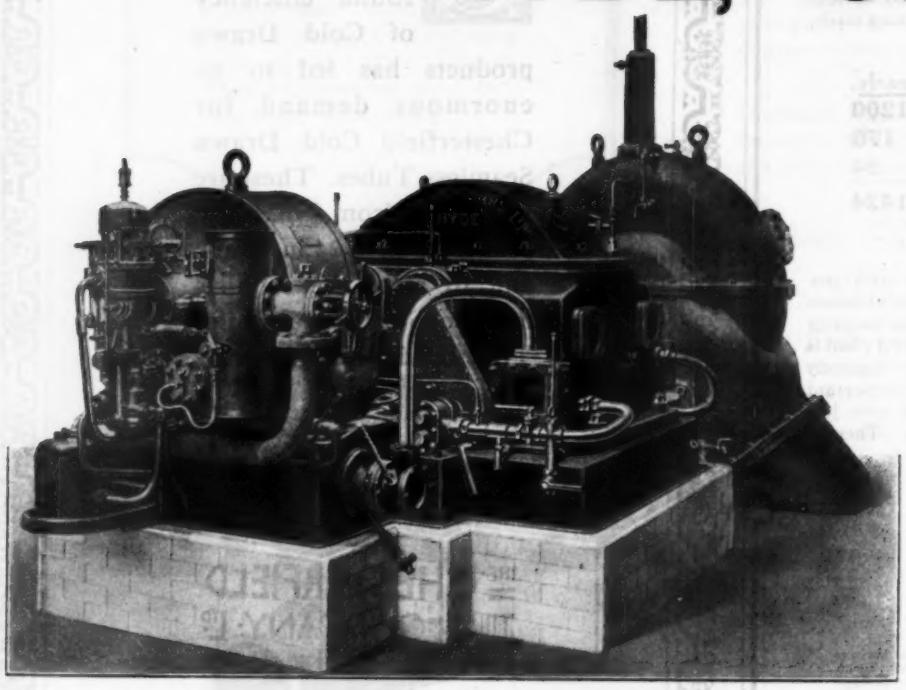

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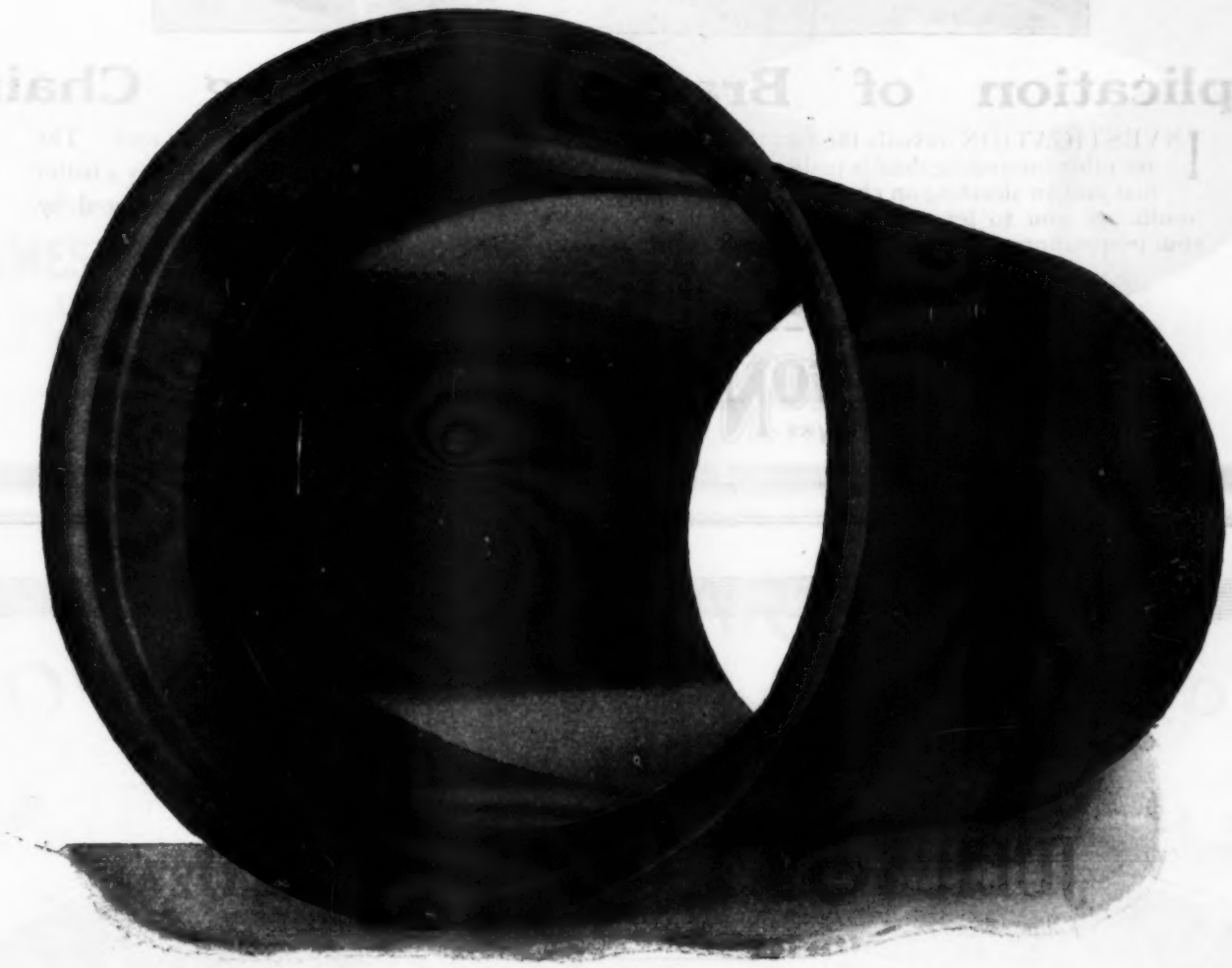

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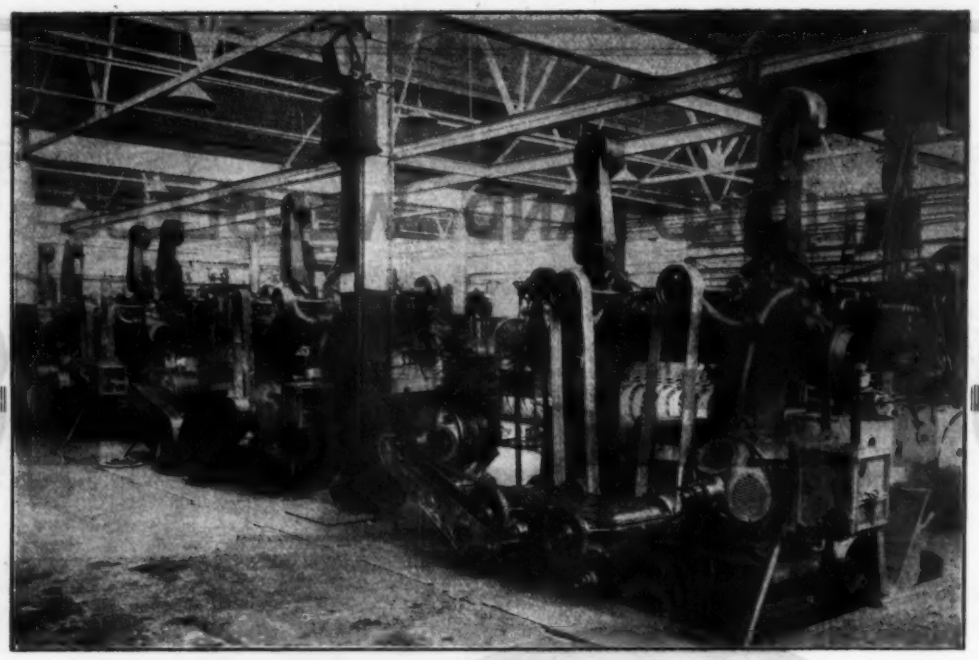

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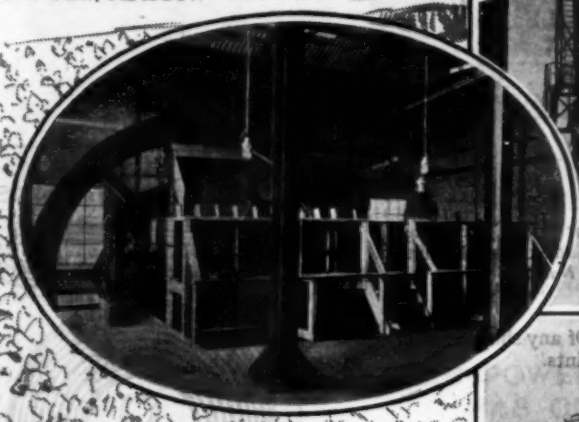

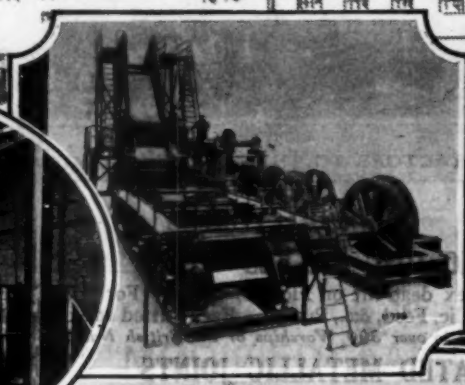

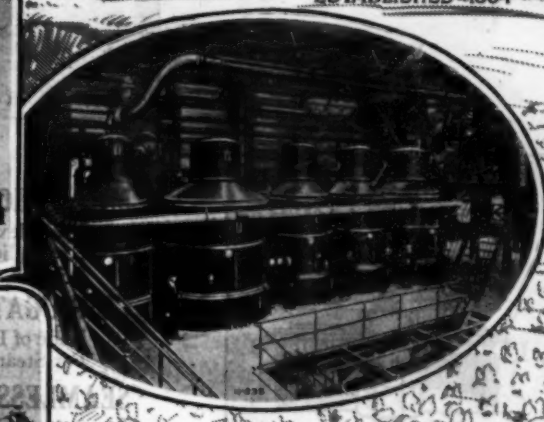

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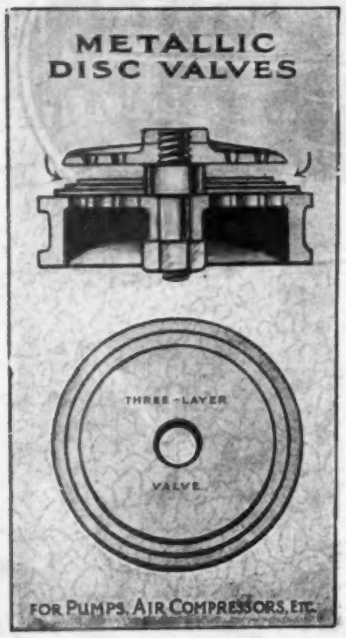

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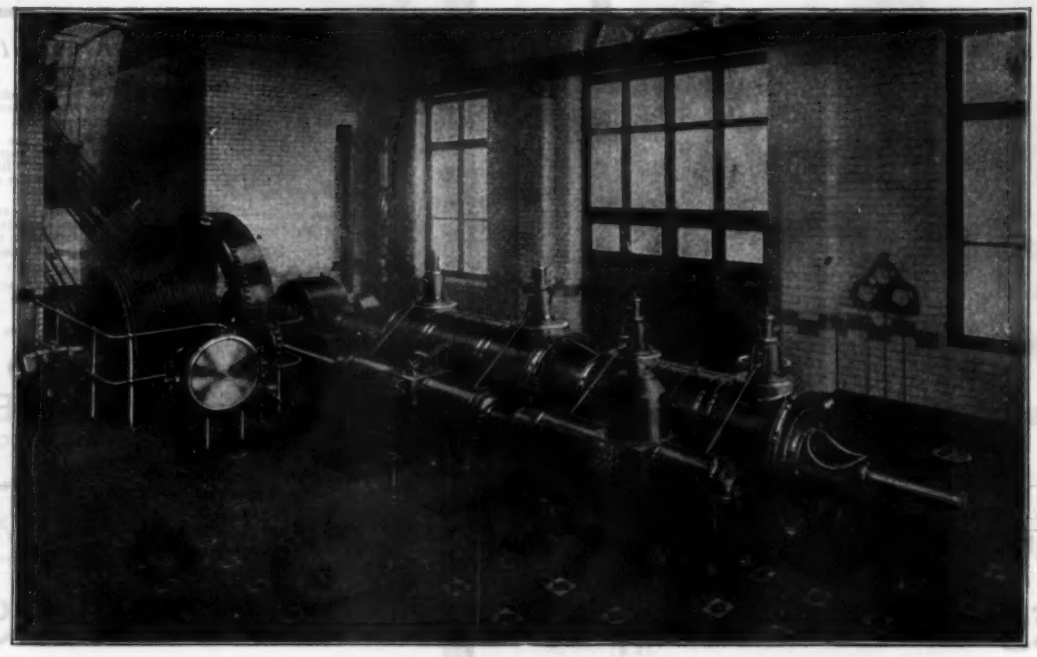

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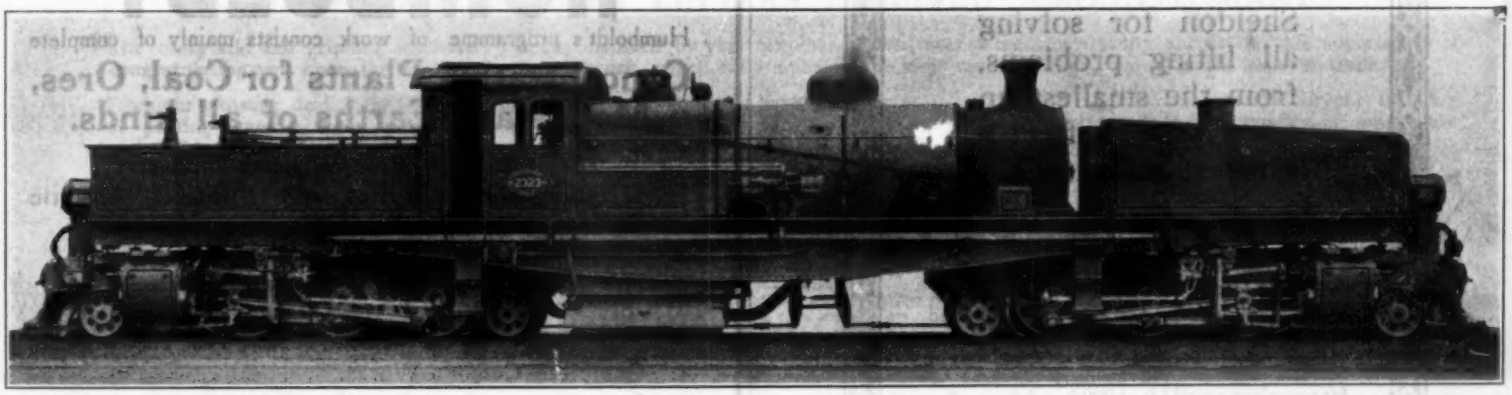
(N. B. L. Co.'s Patents).



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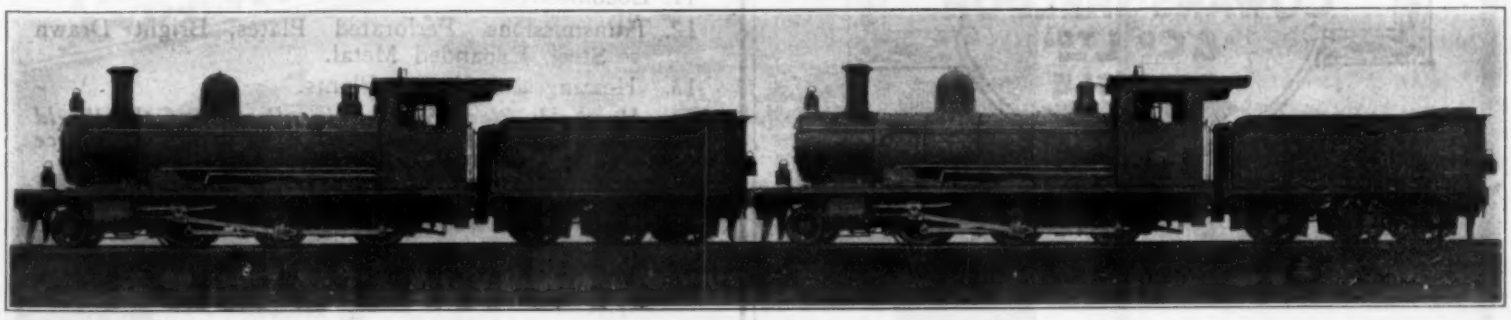

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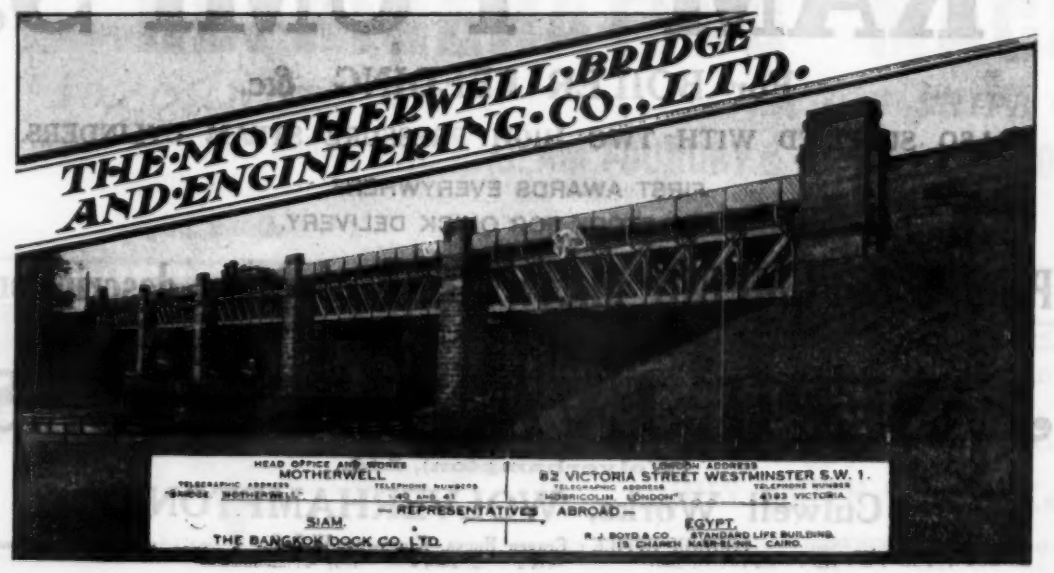
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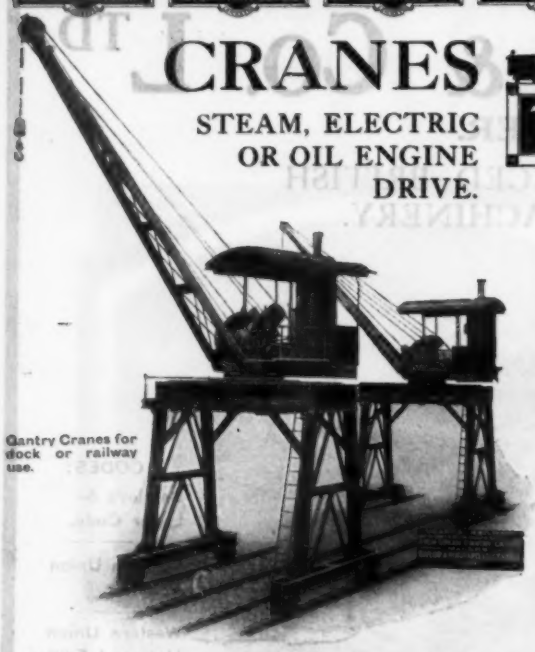

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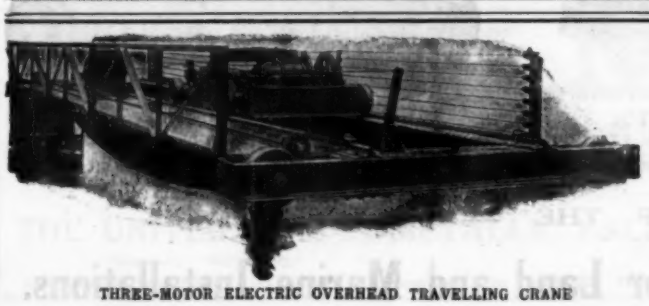

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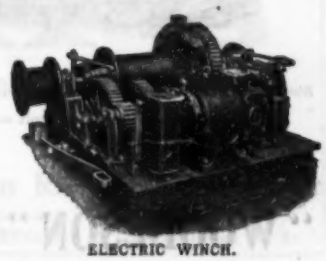

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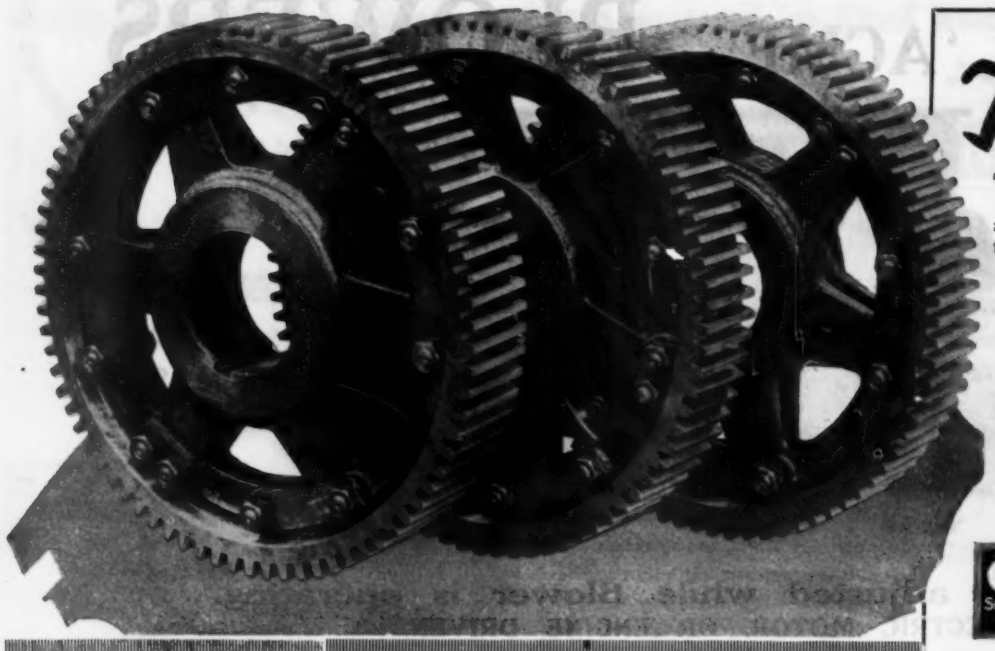

Traction Gears.

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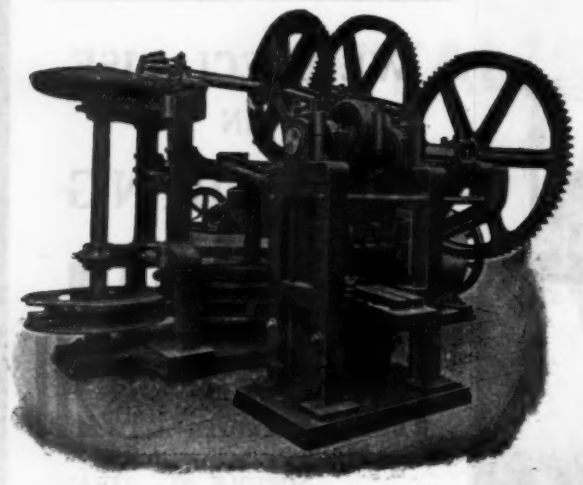

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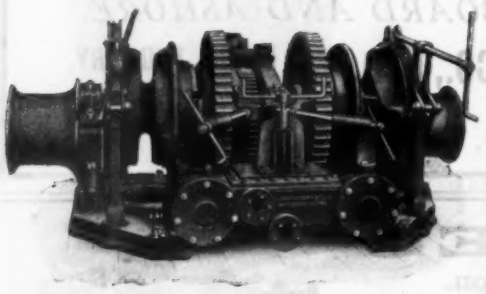
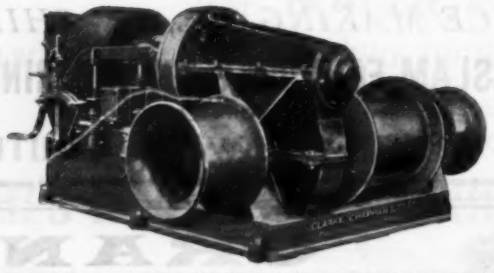


Horizontal Steam and Hand Patent Direct Grip Windlass.
Quick Warping. With all Controls on the aft side.



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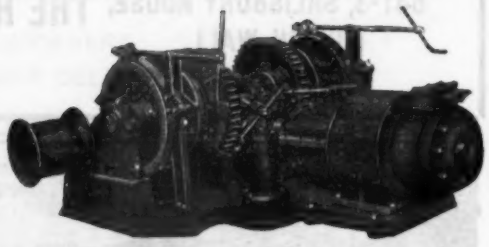

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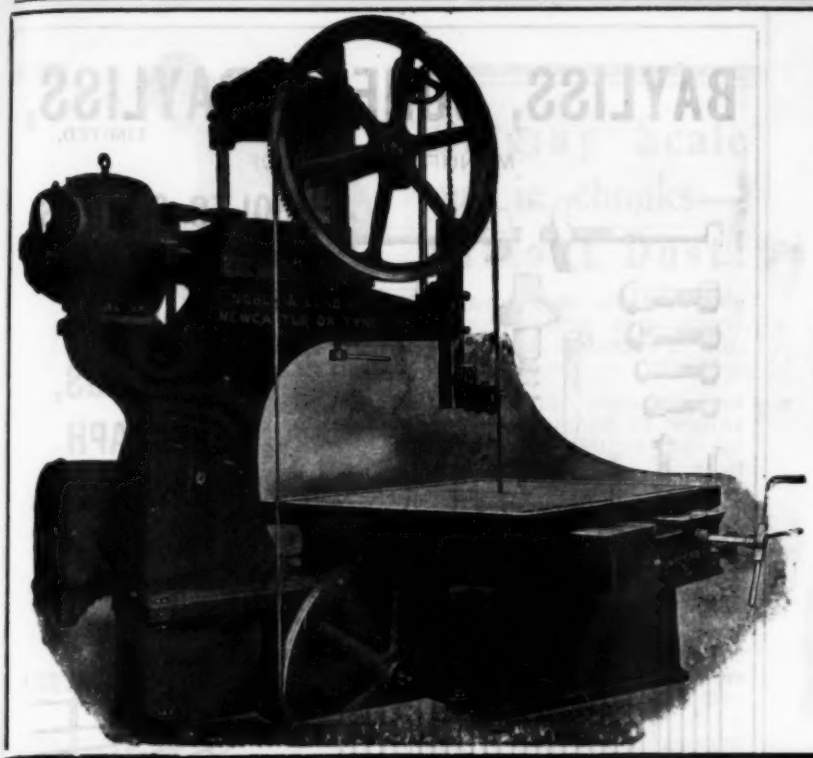

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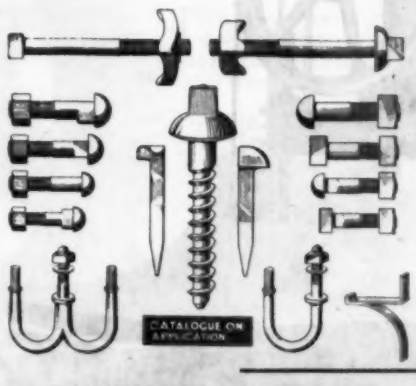

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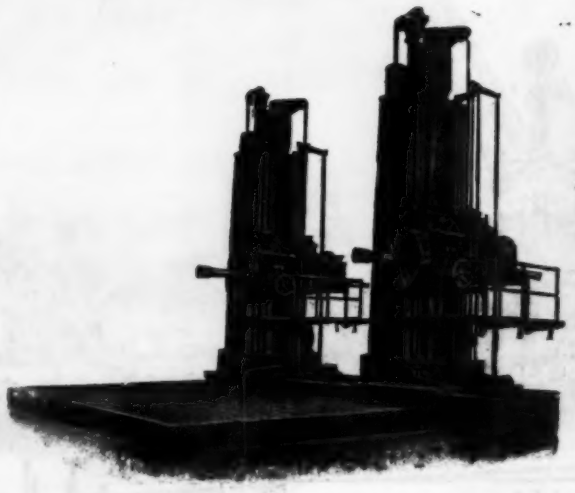

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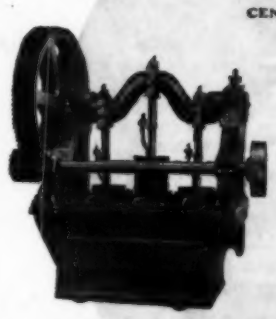

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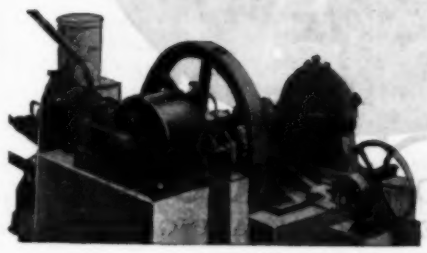

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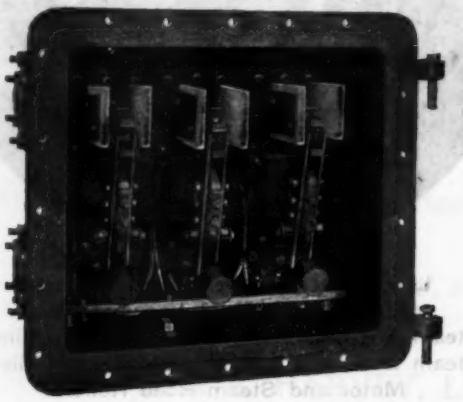

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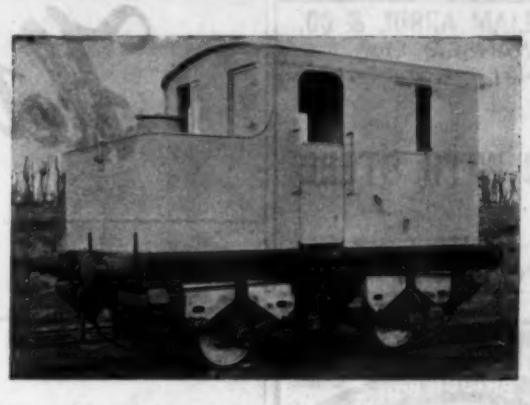

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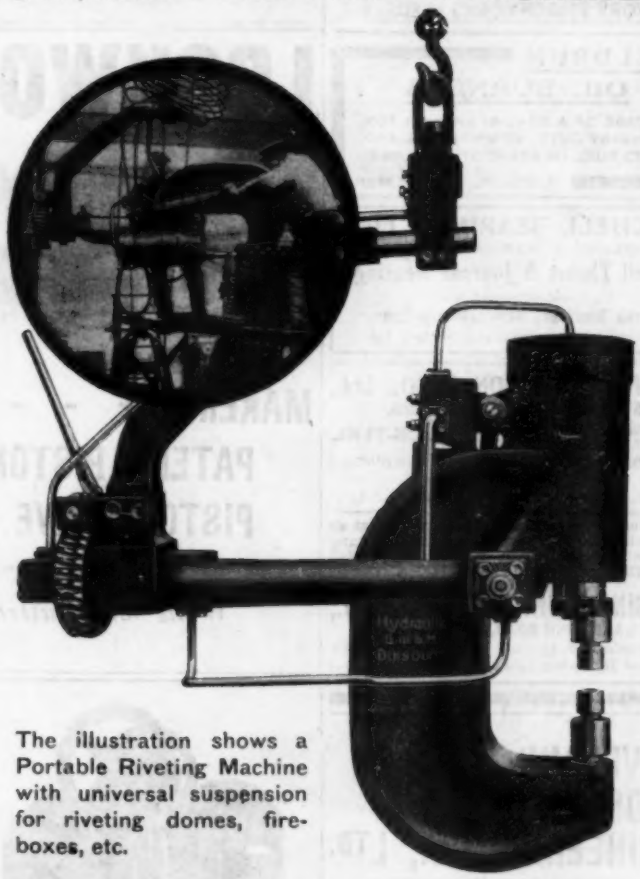

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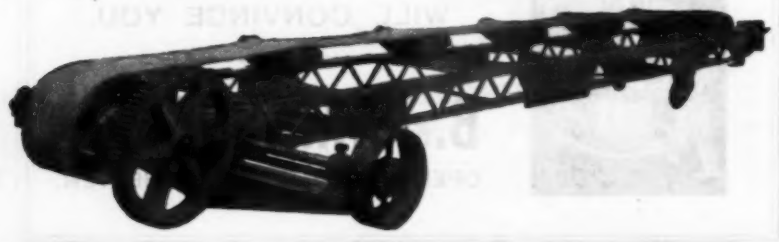

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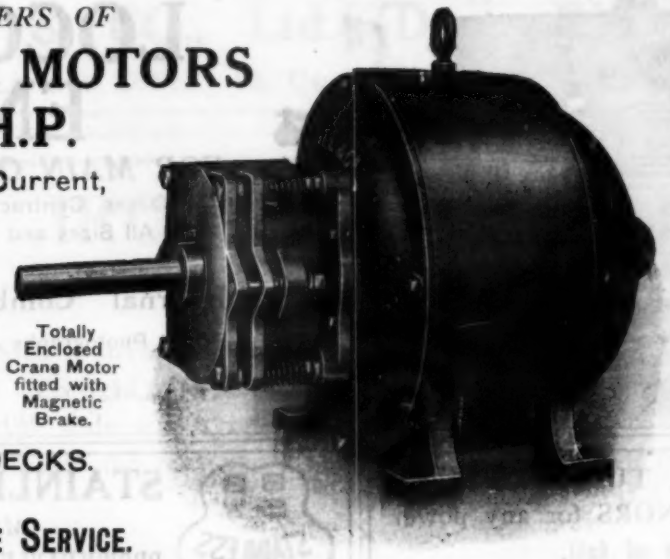

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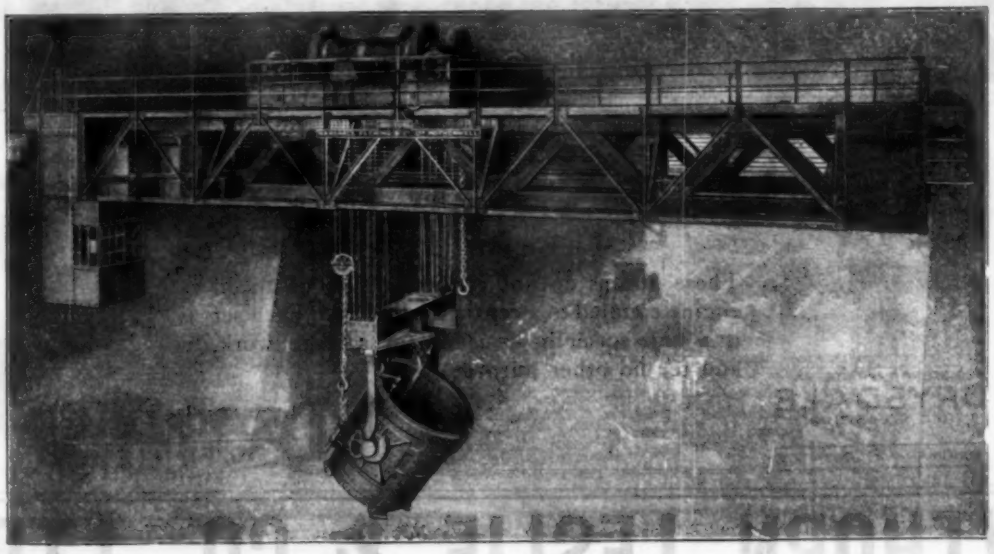

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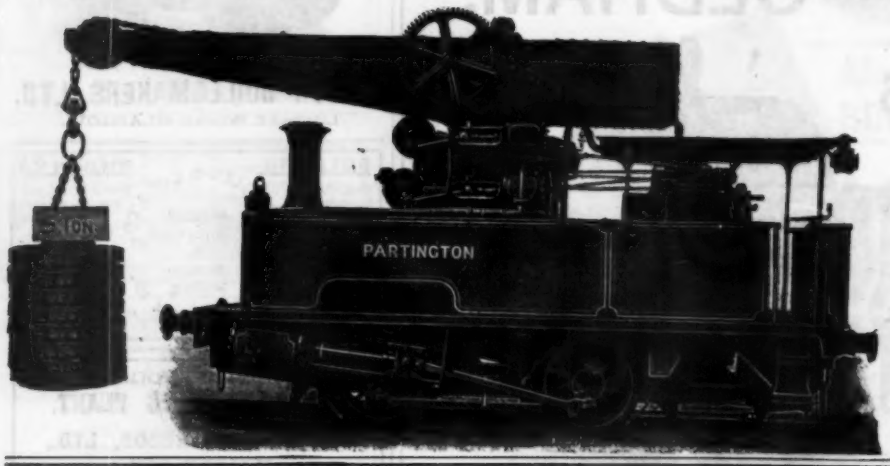

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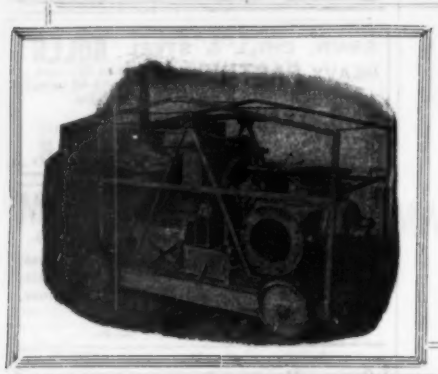

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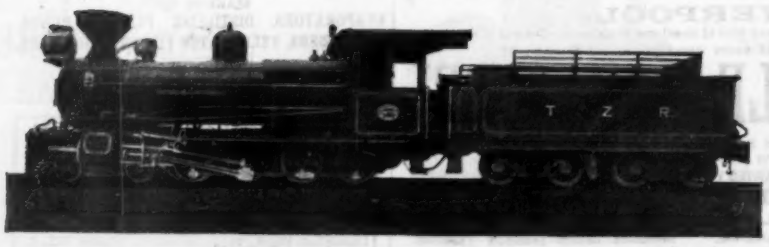

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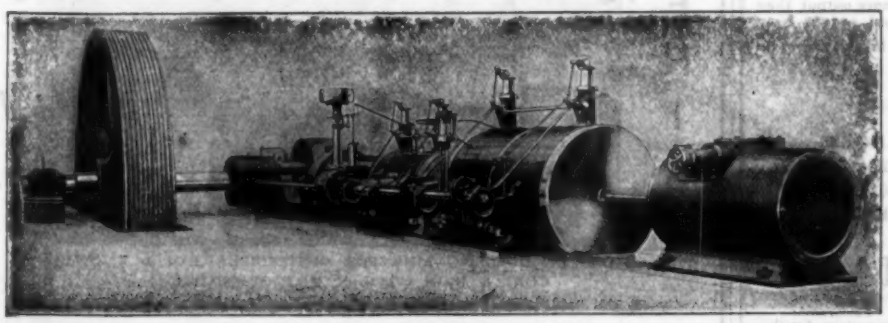

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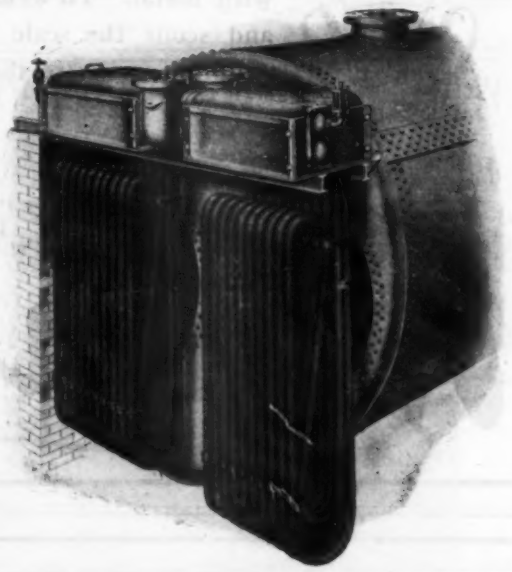

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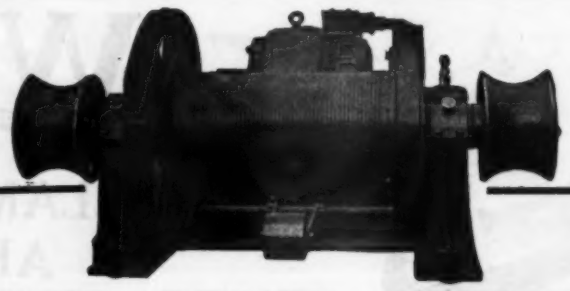

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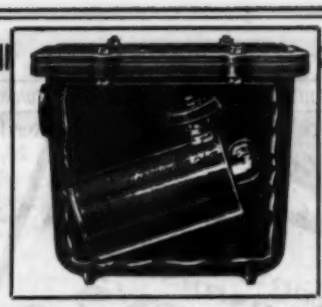

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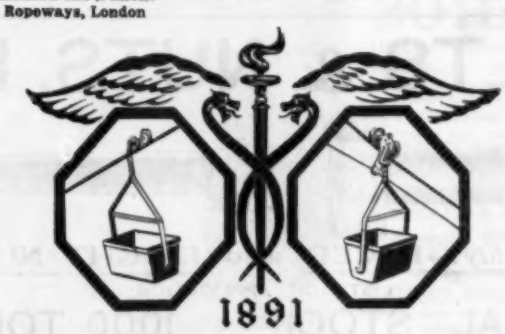

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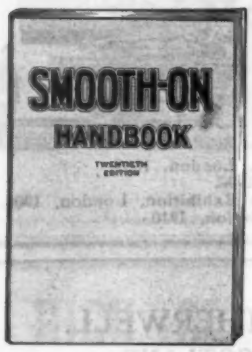

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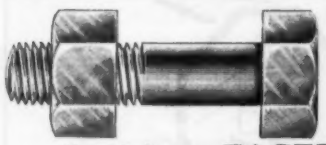

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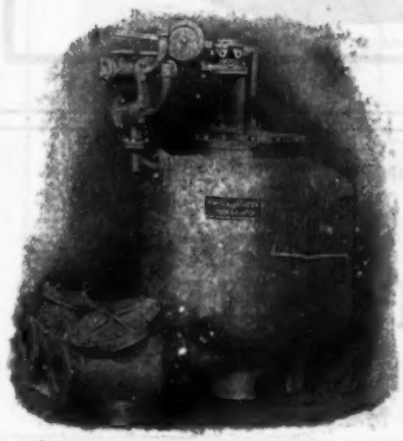

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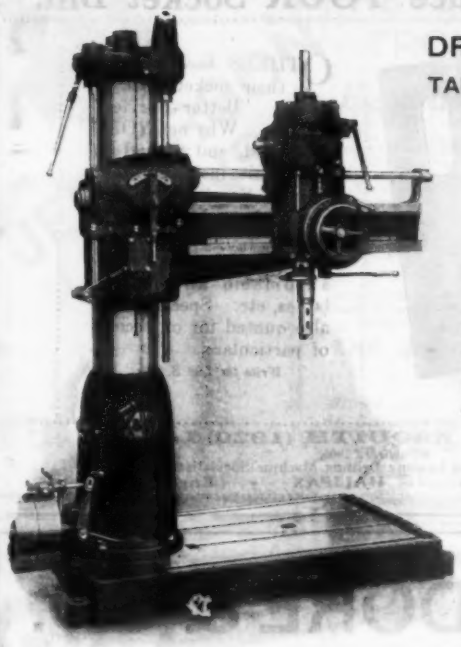

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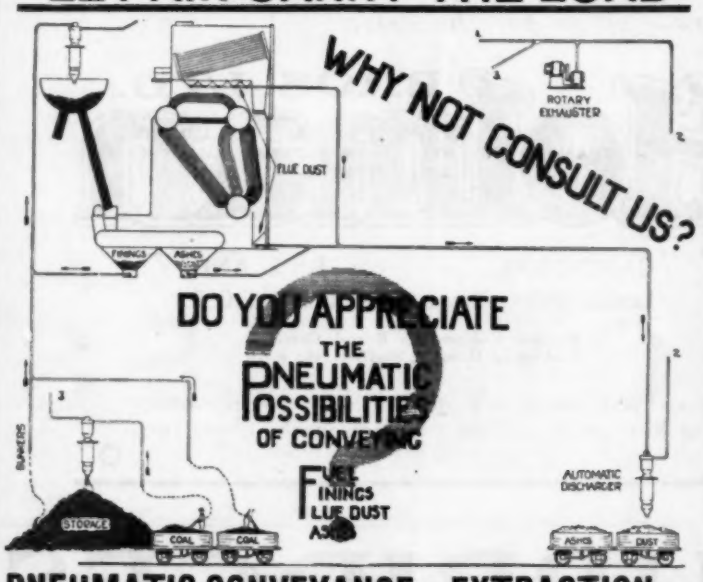

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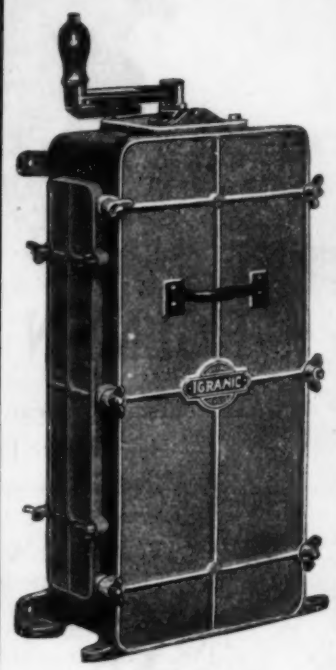

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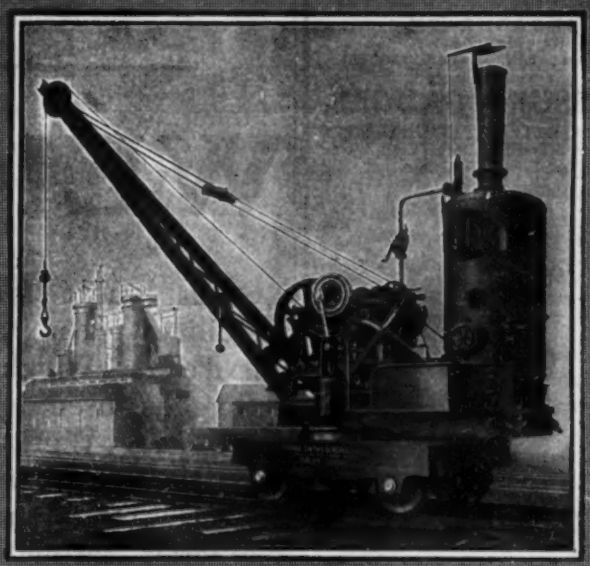

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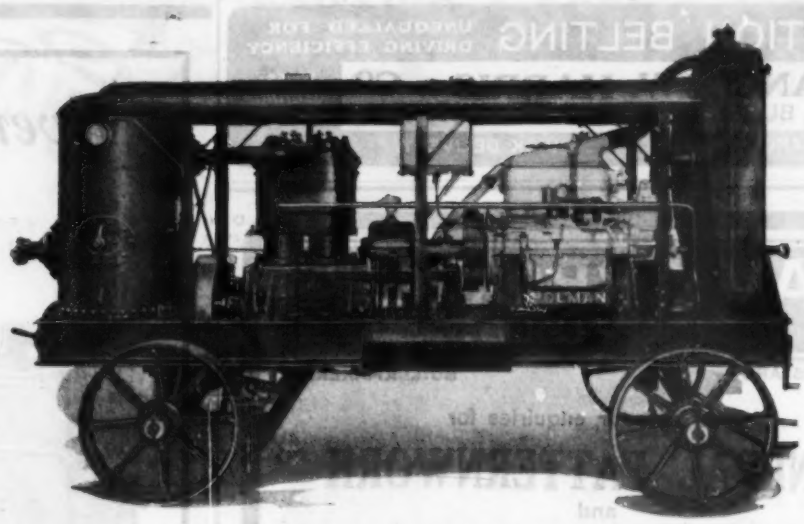

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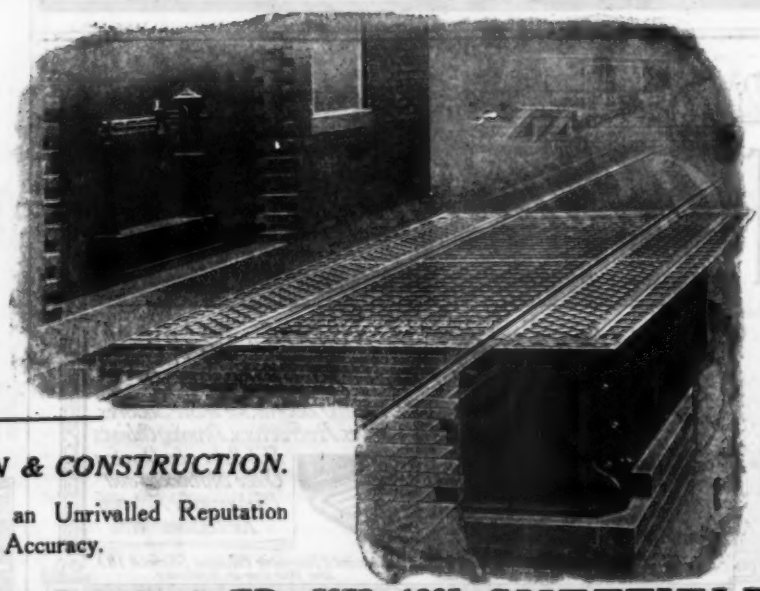

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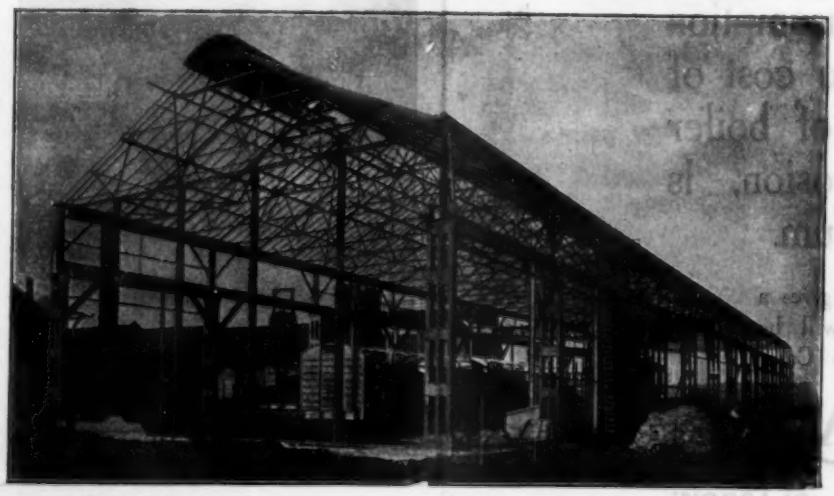

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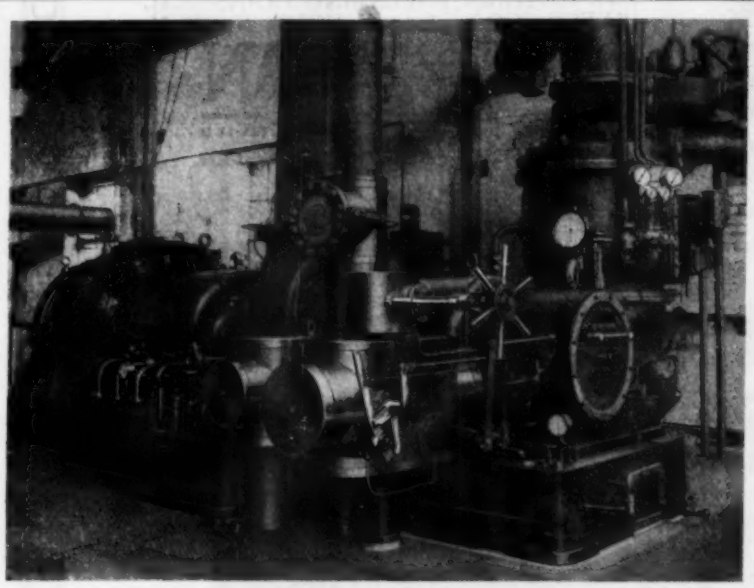

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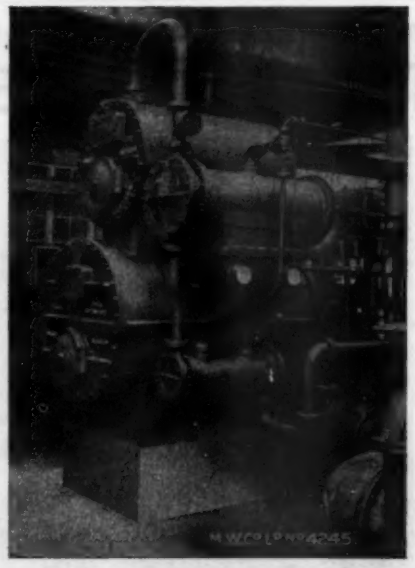

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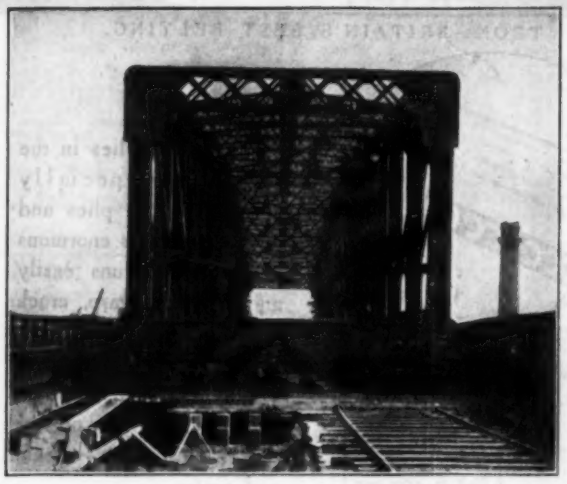

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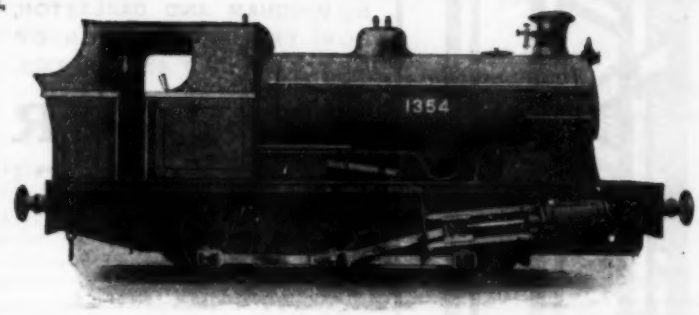

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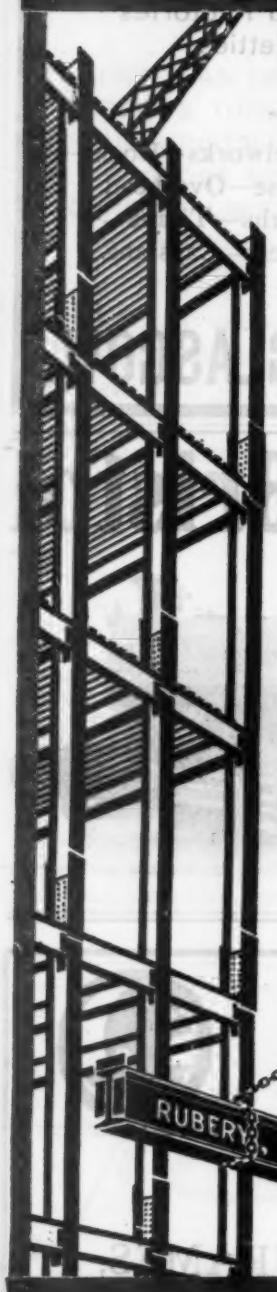

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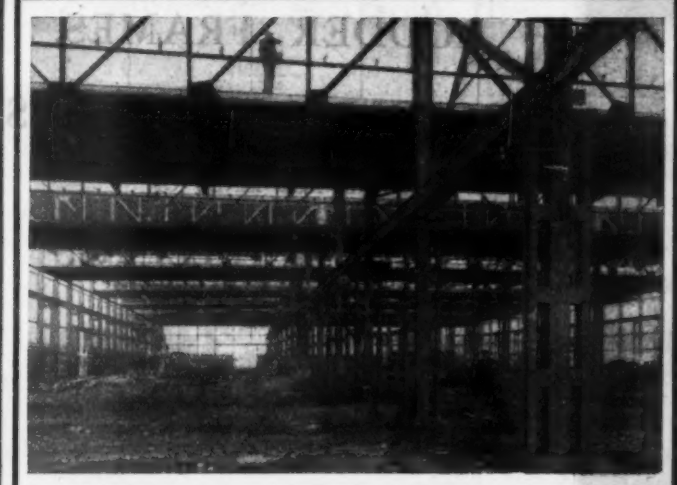

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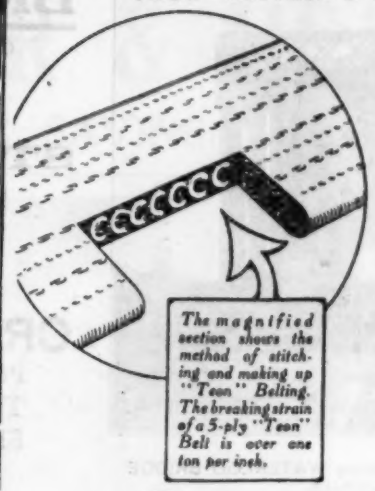

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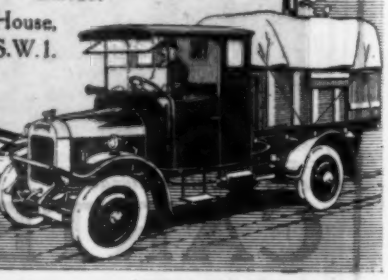

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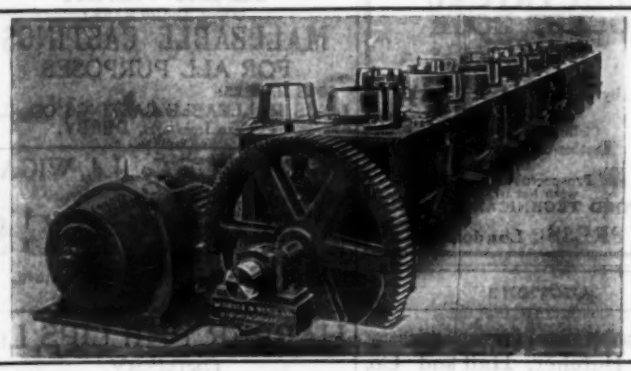

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Oak filing cabinets, pedestal writing tables, bookcases, office tables and chairs, mahogany cupboards, steel cabinets.
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Enamel baths, galvanised tanks, buckets and boilers, flushing cisterns, porcelain hand basins and sinks, gas grills, vegetable warmers, coffee urns, trestles, barrows, ladders, padlocks, shovels, spades, bolts, tarpaulins, 1-TON FORD LORRY, CROSSLEY TENDER, HOSPITAL EQUIPMENT, TURNSTILE ENCLOSURES, CASH BAGS, IRON RAILINGS.

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ONE 20 B.H.P. MOTOR GENERATOR SET, Metropolitan-Vickers floodlights, ironclad cut-outs, electricity meters, Osram lamps, rubber mats, radiators, Unit type feeder pillars (W. Lucy and Co., Oxford).

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PAGE 7.

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are instructed to offer for SALE by AUCTION, on the PREMISES, ISLEWORTH, MIDDLESEX, on WEDNESDAY, 19th JANUARY, 1927, at 11 a.m., the

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Printed for the Proprietors by GEORGE REVEIRS, LIMITED, at Greystoke-place, Fetter-lane, London, and published weekly by ARTHUR RONALD VAUGHAN at THE ENGINEER Office, 33, Norfolk-street, Strand, in the Parish of St. Clement Danes, in the County of Middlesex.